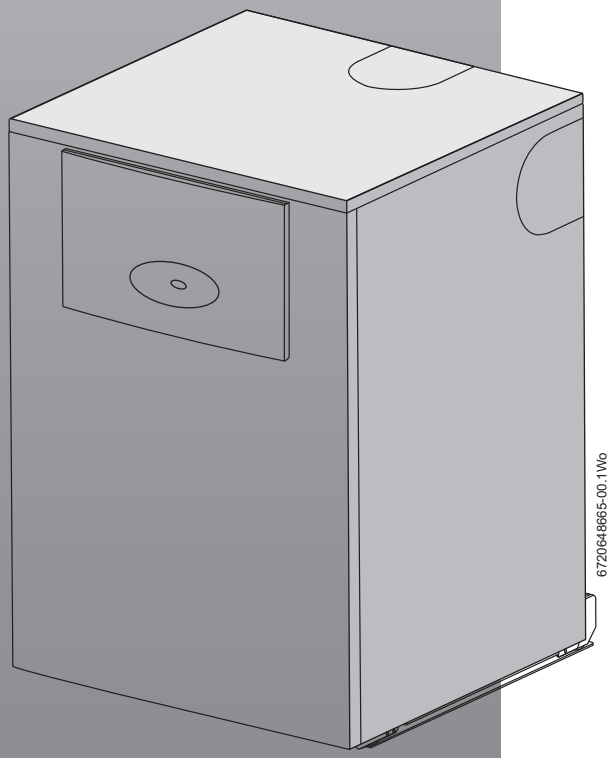
Installation, Commissioning and Servicing Instructions

Floor standing RSF gas fired condensing combination boiler

Greenstar Highflow 440CDi ErP & 550CDi ErP

For sealed central heating systems and mains fed domestic hot water



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The appliances are for use with:
Natural Gas or L.P.G. (Cat. II 2H3P type C13, C33 & C53)

Natural Gas:
440CDi ErP, GC number 47-406-85
550CDi ErP, GC number 47-406-87

L.P.G.:
440CDi ErP, GC number 47-406-86
550CDi ErP, GC number 47-406-88

UK/IE

benchmark
COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

WORCESTER
Bosch Group

6 720 815 062 (2015/05)

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1 KEY TO SYMBOLS AND SAFETY PRECAUTIONS

1.1 Key to symbols

Warnings

Warnings in this document are identified by a warning triangle printed against a grey background.
Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- **NOTICE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

Important information

This symbol indicates important information where there is no risk to people or property.

Additional symbols

Symbol	Explanation
▶	Step in an action sequence
→	Cross-reference to another part of the document
•	List entry
–	List entry (second level)

Table 1

SYMBOLS USED IN THIS MANUAL

	Domestic Hot Water
	Central Heating
	Hot Water Storage Cylinder
	Domestic Cold Water Supply
	Electrical Supply
	Gas Supply

Table 2 Commonly used symbols

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.

These instructions are applicable to the Worcester appliance model(s) stated on the front cover of this manual only and must not be used with any other make or model of appliance.
These instructions apply in the UK and Ireland only and must be followed except for any statutory obligations.
This appliance must be installed by a **GAS SAFE** registered, competent person. Failure to install correctly could lead to prosecution.
If you are in any doubt, contact the Worcester Technical helpline (0330 123 3366).
Please leave these instructions with the completed BENCHMARK CHECKLIST, (or a certificate confirming compliance with IS 813, Eire only) and the user manual with the owner or at the gas meter after installation or servicing.
Distance learning and training courses are available from Worcester.
The BENCHMARK CHECKLIST can be found in the back of this Installation manual.

Table 3

Ø	Diameter
NG	Natural Gas
LPG	Liquid Petroleum Gas
CH	Central Heating
DHW	Domestic Hot Water
DCW	Domestic Cold Water
PRV	Pressure Relief Valve
NTC	Negative Temperature Coefficient (sensor)
IP	Ingress Protection
RCD	Residual Current Device
TRV	Thermostatic Radiator Valve
ECV	Emergency Control Valve
WRAS	Water Regulations Advisory Scheme
SEDBUK	Seasonal Efficiency of Domestic Boilers in the UK

Table 4 Abbreviations use in this manual

1.2 Safety precautions

If you smell gas

A gas leak could potentially cause an explosion. If you smell gas, observe the following rules.

- ▶ Prevent flames or sparks:
  - Do not smoke, use a lighter or strike matches.
  - Do not operate any electrical switches or unplug any equipment.
  - Do not use the telephone or ring doorbells.
- ▶ Turn off the gas at the meter or regulator.
- ▶ Open windows and doors.
- ▶ Warn your neighbours and leave the building.
- ▶ Prevent anyone from entering the building.
- ▶ Well away from the building: call the National Gas Emergency Service on 0800 111 999.
- ▶ L.P.G. boilers: Call the supplier's number on the side of the gas tank.

BOILER OPERATION:

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge.if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

Benchmark places responsibilities on both manufacturers and installers.

The purpose is to ensure that customers are provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer's instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hot water Industry Council who manage and promote the scheme.
Visit **centralheating.co.uk** for more information.

HEALTH AND SAFETY

The appliance contains no asbestos and no substances have been used in the construction process that contravene the COSHH Regulations (Control of Substances Hazardous to Health Regulations 1988).

COMBUSTION AND CORROSIVE MATERIALS

Do not store or use any combustible materials (paper, thinners, paints etc.) inside or within the vicinity of the appliance.

Chemically aggressive substances can corrode the appliance and invalidate any warranty.

FITTING AND MODIFICATIONS

Fitting the appliance and any controls to the appliance may only be carried out by a competent engineer in accordance with the current Gas Safety (Installation and Use) Regulations.

Flue systems must not be modified in any way other than as described in the fitting instructions. Any misuse or unauthorised modifications to the appliance, flue or associated components and systems could invalidate the warranty. The manufacturer accepts no liability arising from any such actions, excluding statutory rights.

SERVICING

Advise the user to have the system serviced annually by a competent, qualified Gas Safe registered engineer. Approved spares must be used to help maintain the economy, safety and reliability of the appliance.

IMPORTANT

The service engineer must complete the Service Record on the Benchmark Checklist after each service.

INSTALLATION REGULATIONS

Current Gas Safety (Installation and Use) Regulations:

All gas appliances must be installed by a competent person in accordance with the above regulations.
Failure to install appliances correctly could lead to prosecution.

The appliance must be installed in accordance with, and comply to, the current: Gas Safety Regulations, IEE Regulations, Building Regulations, Building Standards (Scotland) (Consolidation), Building Regulations (Northern Ireland), local water by-laws, Health and Safety Document 635 (The Electricity at Work Regulations 1989) and any other local requirements.

EU Regulations No. 811/2013 - Energy Labelling.

British Standards:

Where no specific instruction is given, reference should be made to the relevant British Standard codes of Practice.

BS7074:1Code of practice for domestic and hot water supply

BS6891 Installation of low pressure gas pipe work up to 28mm (R1)

BS5546Installation of gas hot water supplies for domestic purposes

EN12828 Central heating for domestic premises

BS5440:1 Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Flues

BS5440:2Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Air Supply

BS7593Treatment of water in domestic hot water central heating systems

BS6798 Installation of gas fired boilers of rated input up to 70kW (net)

Irish Standards

The relevant Irish standards should be followed, including:

- ECTI National rules for electrical installations
- IS 813:2002 for Domestic Gas Installations.

LPG Installations

An appliance using L.P.G. must not be installed in a room or internal space below ground level unless one side of the building is open to the ground.

Timber framed building:

Where the boiler is to be fitted to a timber framed building the guidelines laid down in BS5440: Part 1 and IGE "Gas Installations in Timber Frame Buildings" should be adhered to.

Potable water:

All seals, joints and compounds (including flux and solder) and components used as part of the secondary domestic water system must be approved by WRAS.

CH Water:

Artificially softened water must not be used to fill the central heating system.

2 APPLIANCE INFORMATION

2.1 General information

BOILER FEATURES AND CHECKLIST

- Pre-wired and pre-plumbed
- Galvanised steel inner frame
- Digital control system
- FX Intelligent controls
- Automatic ignition
- Direct burner ignition electrodes
- Built-in frost protection
- Built-in fault finding diagnostics
- Modulating automatic gas valve
- Combustion air fan with speed regulator
- CH temperature sensor and control
- Pump anti-seizure protection
- Flue gas temperature sensor
- Condensate trap and pump
- DHW flow sensor and temperature control
- Plate type DHW heat exchanger

CHECK LIST - LITERATURE PACK:	**Qty.**
Greenstar 440CDi ErP & 550CDi ErP Installation, Commissioning and Servicing Instructions	1
Users Instructions	1

Table 5 Literature pack - checklist

CHECK LIST - iNSTALLATION PACK:	**Qty.**
Sealing Pack:	1
- Compression Nut 22mm	3
- Compression Ring 22mm	3
- Compression Nut 15mm	3
- Compression Ring 15mm	3
- Fibre Washer 18.6 x 13.5 x 1.5	2
- Fibre Washer 23.9 x 17.2 x 1.5	2
- Bonded Washer 3/4	1

Table 6 Installation pack - checklist

STANDARD PACKAGE:

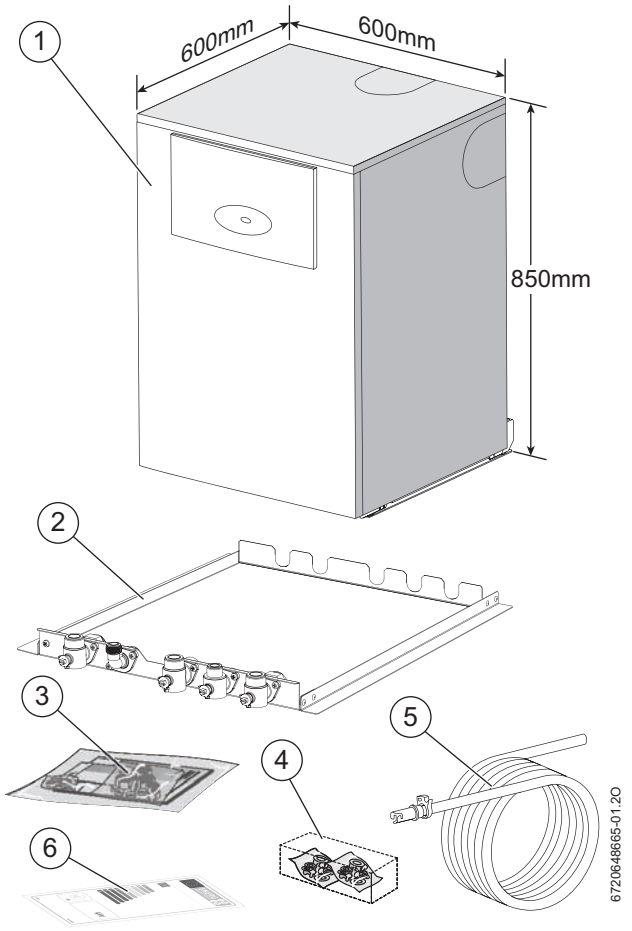


Fig. 1 Standard package

[1] Floor standing gas fired combination boiler for central heating and domestic hot water.
[2] Mounting frame complete with pre-plumbing manifold assembly.
[3] Literature pack.
[4] Installation pack.
[5] Condensate waste pipe and non-return valve.
[6] ErP energy label

2.2 Technical data

DESCRIPTION	UNITS	Natural Gas		L.P.G	
		440CDi ErP	550CDi ErP	440CDi ErP	550CDi ErP
Central Heating					
Max. rated heat output net 40/30°C	kW	31.2	32.8	31.2	32.8
Max. rated heat output net 50/30°C	kW	30.9	32.5	30.9	32.5
Max. rated heat output net 80/60°C	kW	29.2	30.6	29.2	30.6
Max. rated heat input net	kW	29.6	31	29.6	31
Min. rated heat output net 40/30°C	kW	8.4	11	11.6	13.4
Min. rated heat output net 50/30°C	kW	8.3	10.9	11.4	13.2
Min. rated heat output net 80/60°C	kW	7.4	9.7	10.5	12.1
Min. rated heat input net	kW	7.6	10	10.8	12.5
Max. flow temperature	°C	88	88	88	88
Max. permissible operating pressure	bar	2.5	2.5	2.5	2.5
Domestic Hot Water					
Max. rated heat input net	kW	29.6	41.5	29.5	41.5
Max. rated heat output	kW	29.5	41.1	29.2	41.1
Minimum flow rate to start	l/min	2.3	2.8	2.3	2.8
Minimum pressure for max flow rate 20 l/min (±15%)	bar	1.5	-	1.5	-
Minimum pressure for max flow rate 25 l/min (±15%)	bar	-	1.7	-	1.7
Specific rate - 30°C rise - heat store hot	ltr/min	20 for 10 min.	25 for 10 min.	20 for 10 min.	25 for 10 min.
Specific rate - 30°C rise - heat store off	ltr/min	14	19.6	14	19.6
Time to heat tank 15°C to 65°C	mins	13	13	13	13
Gas flow rate - Max. 10 minutes from lighting					
Natural Gas G20	m^2/h	3.1	4.4	-	
Propane Gas (LPG)	kg/h	-		2.3	3.2
Gas supply pressure					
Natural Gas G20	mb	20	20	-	
LPG (Propane) Gas G31	mb	-		37	37
Flue					
Flue Gas Temp. 80/60°C, rated min. load	°C	67/55	67/55	67/55	67/55
Flue Gas Temp. 40/30°C, rated min. load	°C	43/32	43/32	43/32	43/32
CO2 level at max. rated heat output	%	9.4	9.4	10.8	10.8
CO2 level at min. rated heat output	%	8.6	9.0	10.4	10.4
NOx - classification	class	5	5	5	5
Condensate					
Max. condensation rate	l/h	2.7	3.7	2.7	3.7
pH value, approx.		4.8	4.8	4.8	4.8
Electrical					
Electrical power supply voltage	AC...V	230	230	230	230
Frequency	Hz	50	50	50	50
Max. power consumption	W	164	206	164	206
Expansion Vessel					
Charge Pressure	bar	0.75	0.75	0.75	0.75
Total Capacity	ltr	12	12	12	12
General Data					
SAP 2009 annual efficiency	%	89.2	89.2	90.2	90.2
SAP 2005 seasonal efficiency (SEDBUK)	%	90.8	90.8	92.2	92.2
Appliance protection rating	IP	x4D	x4D	x4D	x4D
Appliance protection rating (with mechanical timer, MT10RF or FW100 fitted into fascia)	IP	20	20	20	20
Permissible ambient temperatures	°C	0 - 50	0 - 50	0 - 50	0 - 50
Nominal capacity of appliance	ltr	51	51	51	51
Noise output level (at maximum CH output)	dB(A)	37	37	37	37
Weight (excluding packaging)	kg	112	112	112	112

Table 7

2.3 Product data on energy consumption

The following product data satisfy the requirements of the EU Regulations No. 811/2013 and No. 812/2013 supplementing Directive 2010/30/EU.

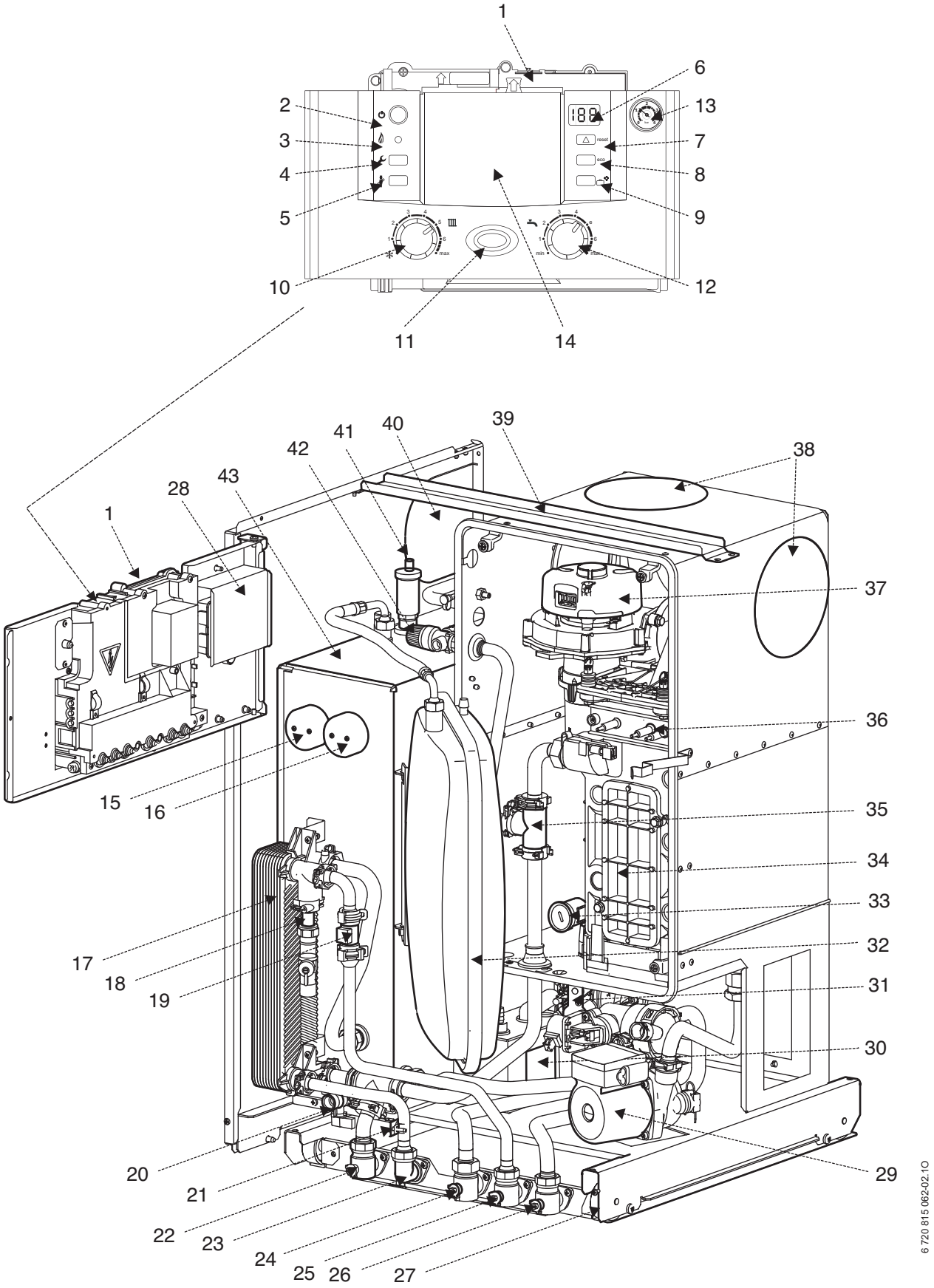
Product data	Symbol	Unit	7 738 100 589	7 738 100 591	7 738 100 590	7 738 100 592
Product type	–	–	440CDi ErP	550CDi ErP LPG	440CDi ErP	550CDi ErP LPG
Condensing boiler	–	–	Yes	Yes	Yes	Yes
Combination heater	–	–	Yes	Yes	Yes	Yes
Rated heat output	P_{rated}	kW	30	30	31	31
Seasonal space heating energy efficiency	η_s	%	92	92	92	92
Energy efficiency class	–	–	A	A	A	A
Useful heat output						
At rated heat output and high temperature regime 1)	P_4	kW	29.6	29.6	31.0	31.0
At 30 % of rated heat output and low temperature regime 2)	P_1	kW	9.6	9.6	10.0	10.0
Useful efficiency						
At rated heat output and high temperature regime 1)	η_4	%	88.5	88.5	88.5	88.5
At 30 % of rated heat output and low temperature regime 2)	η_1	%	97.1	97.1	97.1	97.1
Auxiliary electricity consumption						
At full load	el_{max}	kW	0.041	0.041	0.042	0.042
At part load	el_{min}	kW	0.018	0.018	0.018	0.018
In standby mode	P_{SB}	kW	0.004	0.004	0.004	0.004
Other items						
Standby heat loss	P_{stby}	kW	0.053	0.053	0.053	0.053
Emissions of nitrogen oxides	NOx	mg/kWh	23	23	23	23
Sound power level, indoors	L_{WA}	dB(A)	53	53	52	52
Additional data for combination heaters						
Declared load profile	–	–	XL	XL	XL	XL
Daily electricity consumption	Q_{elec}	kWh	0.350	0.350	0.357	0.357
Annual electricity consumption	AEC	kWh	77	77	79	79
Daily fuel consumption	Q_{fuel}	kWh	27.356	27.356	28.047	28.047
Annual fuel consumption	AFC	GJ	1,672	1,672	1,714	1,714
Water heating energy efficiency	η_{wh}	%	72	72	71	71
Water heating energy efficiency class	–	–	B	B	B	B

Table 8 Product data for energy consumption

1) High temperature regime means 60 °C return temperature at heater inlet and 80 °C feed temperature at heater outlet.

2) Low temperature means for condensing boilers 30 °C, for low-temperature boilers 37 °C and for other heaters 50 °C return temperature (at heater inlet).

2.4 Layout and components



1	CONTROL PANEL	23	DHW OUTLET
2	MASTER SWITCH FOR ON/OFF	24	GAS ISOLATION VALVE
3	BURNER ON INDICATOR LIGHT (GREEN)	25	MAINS WATER INLET ISOLATION VALVE
4	SERVICE BUTTON	26	CH RETURN ISOLATION VALVE
5	CENTRAL HEATING BOOST BUTTON	27	RUNNER WHEEL ON MOUNTING FRAME
6	DISPLAY	28	INSTALLER MODULE PROTECTIVE COVER
7	RESET BUTTON	29	LOW ENERGY CIRCULATING PUMP
8	ECO BUTTON	30	CONDENSATE PUMP ASSEMBLY
9	NOT USED	31	GAS VALVE
10	CH TEMPERATURE CONTROL	32	EXPANSION VESSEL
11	MAINS ON/OFF INDICATOR & FAULT DIAGNOSTIC LIGHT	33	AIR/GAS ADJUSTMENT SCREW (SEALED)
12	DHW TEMPERATURE CONTROL	34	HEAT CELL
13	SYSTEM PRESSURE GAUGE	35	CH FLOW TEE PIECE
14	POSITION FOR OPTIONAL PROGRAMMER	36	GAS BURNER/SPARK ELECTRODES
15	TANK TEMPERATURE SENSOR	37	COMBUSTION AIR MODULATING FAN
16	TANK OVERHEAT THERMOSTAT	38	FLUE BLANKING PLATES
17	DHW HEAT EXCHANGER	39	CASING SUPPORT STRUT
18	FILLING LOOP ISOLATION VALVE	40	CASE ‘KNOCK-OUT’ PANEL FLUE
19	WATER FLOW SENSOR TURBINE	41	AUTO AIR VENT
20	BOILER/TANK DRAIN & CONNECTION POINT FOR FILLING LOOP	42	SYSTEM PRESSURE RELIEF VALVE
21	DHW TEMPERATURE SENSOR	43	HEAT STORE
22	CH FLOW ISOLATION VALVE		

Table 9

3 PRE-INSTALLATION

3.1 Cleaning primary systems

NOTICE: Before installation
- ▶ All the following Pre-Installation sections must be read and requirements met before starting boiler or flue installations.

CAUTION: MAINS POWER
- ▶ ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

NOTICE: Protect the boiler
- ▶ Debris from the system can damage the boiler and reduce efficiency.Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance warranty.
- ▶ It is recommended that a primary water cleanser is fitted to the system. Worcester offers a filter that helps remove both magnetite and non-magnetic debris. Part number 7 716 192 609

BEFORE CLEANING THE SYSTEM:

- ▶ **Ensure that the system and pipe work is in good working order.**
- ▶ **Where possible keep the existing boiler/circulating pump in place when flushing the system.**

FOLLOW THE GUIDANCE OF BS7593:

Treatment of water in domestic hot water central heating and also the flushing guidelines below.

NOTICE: ARTIFICALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.

FLUSHING THE SYSTEM

- ▶ Fill the system with cold water and check for leaks.
- ▶ Open all drain cocks and drain the system.
- ▶ Close drain cocks and add a suitable flushing agent **compatible with aluminium** at the correct strength for the system conditions in accordance with the manufacturer's instructions.
  The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.
- ▶ Circulate the flushing agent before the boiler is fired up.
- ▶ Run the boiler/system at normal operating temperature as directed by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.
- ▶ It may be necessary to use a power flushing machine to aid the cleansing procedure in some circumstances.
- ▶ Close the drain cocks and refill with fresh water and a suitable inhibitor.
- ▶ Vent any air from the boiler and system.

INHIBITOR

Add a suitable inhibitor or combined inhibitor/anti-freeze, if the system is exposed to freezing conditions, to the heating system in accordance with the DWTA code of practice and manufacturer's guidelines.

WARNING: Sealing agents
- ▶ The addition of sealing agents to the system water is not permitted as this can cause problems with deposits left in the heat exchanger.
- ▶ In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

Water treatment

Suitable water treatment products can be obtain from the following manufacturers:

FERNOX	0870 601 5000
	www.fernox.com
SENTINEL	0800 389 4670
	www.sentinel-solutions.net

Table 10

Artificially softened water

It is possible to have an ion exchange water softener fitted to the cold water system of the property. However, the boiler requires an untreated cold water connection taken from the mains supply, before the water softener, to the primary water filling point of the heating system.

Alternatively there are water softening/treatment devices that do not adjust or alter the pH levels of the water. With these devices it may not be necessary to provide an untreated water by-pass to the primary water filling point of the heat system.

3.2 Mains supply

3.2.1 Electrical supply

- Supply: 230V - 50 Hz, 140 Watts
- Cable: PVC insulated 0.75 mm2 (24 x 0.2 mm) temperature rated to 90°C.
- External 3A fuse to BS1362.
- The appliance must be earthed.
- This appliance must not be connected to a three phase supply.
- IPX4D.

NOTICE: This is reduced to IP20 if the following mechanical timers are fitted;
7 716 192 036 or 7 716 192 037 or clip-in weather compensating controller.

- Wiring must comply with the latest IEE wiring regulations.

3.2.2 Gas supply

- Boilers using Natural Gas (NG) must be connected to a governed meter.
- Liquid Petroleum Gas (LPG) must be connected to a regulator.
- Installation and connection of the gas supply to the boiler must be in accordance with BS6891.
- Under no circumstance should be size of the gas supply pipe be less than 22 mm.
- The meter or regulator and pipe work to the meter must be checked, preferably by the gas supplier. This is to ensure that the equipment is in good working order and can meet the gas flow and pressure requirements, in addition to the demand from any other appliance being served.

3.2.3 Water supply

WATER MAINS PRESSURE:

- Minimum mains water pressure: 1.7 bar for maximum performance.
- Maximum mains fed water pressure 10 bar.
  If necessary fit a pressure reducing valve.

NOTICE: Non return, flow back prevention devices (including those associated with water meters) fitted to the mains water supply can cause a pressure build up which could damage the boiler and other household appliances.

- Where the mains water supply has a non-return, flow back prevention valve fitted, a mini expansion vessel (1) should be connected to the mains water inlet pipe (2) between the non-return valve
  (3) and the boiler (4) as shown below

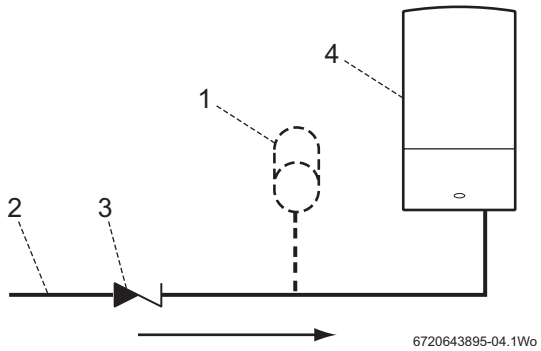


Fig. 2 Mains water pressure

1	Mini expansion vessel - part no. 7 716 102 105
2	Mains water inlet pipe
3	Non return valve
4	Boiler

Table 11

USE IN HARD WATER AREAS:

Normally there is no need for water treatment to prevent scale formation as the maximum temperature of the HW heat exchanger is limited by the electronic control.

In areas where temporary water hardness exceeds 200ppm, consideration may need to be given to the fitting of a scale prevention device. In such circumstances, the advice of the local water authority should be sought.

3.3 Water systems and pipe work

PRIMARY SYSTEM PLASTIC PIPEWORK:

- Any plastic pipe work must have a polymeric barrier with 600mm (minimum) length of copper connected to the boiler.
- Plastic pipe work used for under floor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approximately 50°C. The pipe work from the boiler to the blending valve must be in copper.

PRIMARY SYSTEM/CONNECTIONS/VALVES:

- **Do not use galvanised pipes or radiators.**
- All system connections, taps and mixing valves must be capable of sustaining a pressure of 3 bar.
- Radiator valves should conform to BS2767:10.
- All other valves should conform to BS1010.
- On new installations TRV's should be used on all radiators except the radiator where the room thermostat is sited, this must befitted with lock-shield valves and left open. All installations should have TRV's fitted to radiators within the sleeping accommodation.
- Drain cocks are required at all the lowest points on the system.
- Air vents are required at all high points on the system.

SEALED PRIMARY SYSTEM:

- Where the system volume is more than 100 litres or exceeds 2.5 bar at maximum heating temperature an extra expansion vessel (2) must be fitted as close as possible to the appliance in the central heating return.
- Pressurise the extra expansion vessel (2) to the same figure as the expansion vessel built into the appliance- REFER TO TECHNICAL DATA TABLE.

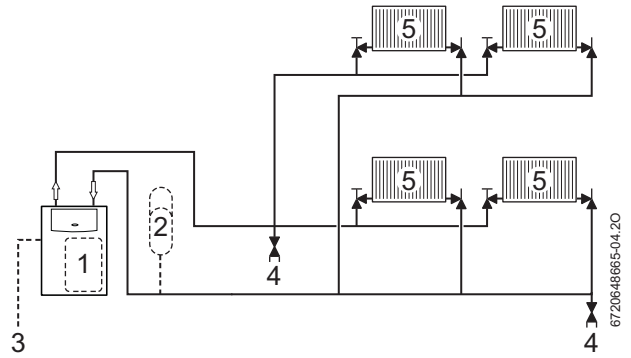


Fig. 3 Typical sealed system

1 - Appliance expansion vessel
2 - Extra expansion vessel
3 - Pressure relief discharge
4 - Drain cock
5 - Radiators

FILLING PRIMARY SYSTEMS:

- The boiler comes with an internal fitted filling loop system and can be used to fill the system.
- The CH sealed system must be filled using a WRAS approved filling loop or comply with the diagram below for system fill externally fitted.
- The filling point must be at low level and must never be a permanent direct fixing to the mains water supply.

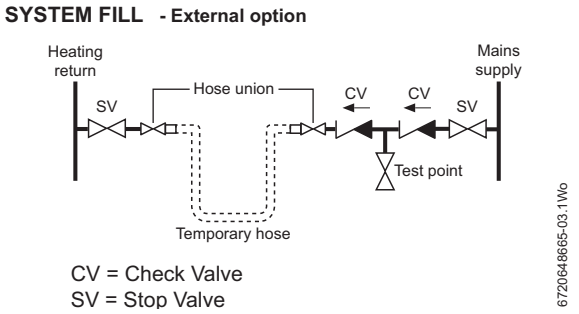


Fig. 4 External filling option

SHOWERS/BIDETS:

- If a shower head can be immersed in water or comes closer than 25mm from the top edge of a bath or shower tray spill over level then an anti-siphon device must befitted to the shower hose.
- Bidets with direct hot and cold mains water can be used (with the approval of the local water authority) and must be the over rim flushing type with shrouded outlets to prevent the fitting of hand held sprays.

DOMESTIC HOT WATER:

- Taps and mixing valves must be capable of sustaining a pressure up to 10 bar.
- Hot water temperature and flow rate are affected by the size and insulation of pipe work making up the distribution system and are controlled by the hot water tap and the water main inlet pressure. A mixing valve can be fitted if a more permanent setting is required.
- If using more than one outlet at once causes water flow starvation, fit flow balancing valves or Ball-O-Fix valves to the appropriate outlets.

3.4 Condensate pipe work

NOTICE:

- ▶ Where a new or replacement boiler is being installed, access to an internal "gravity discharge" point should be one of the factors considered in determining boiler location.
- ▶ The condensate pipe must be nominally 22mm Ø plastic pipe.
- ▶ The condensate pipe work must fall at least 52mm per metre towards the outlet and should take the shortest practicable route.
- ▶ Ensure there are no blockages in the pipe run.

Key to condensate illustrations	
1	Condensate discharge from boiler
2	Condensate pump within boiler
3	Soil and vent stack
4	Minimum 450mm and up to three storeys
5	Visible air break at plug hole
6	Sink or basin with integrated overflow
7	75mm sink waste trap
*	Condensate trap of 75mm already incorporated into the boiler

Table 12

3.4.1 Internal connections

In order to minimise risk of freezing during prolonged cold spells, the following methods of installing condensate drainage pipe should be adopted, in order of priority.

Wherever possible, the condensate drainage pipe should be routed and terminated so that the condensate drains away from the boiler under gravity to a suitable internal foul water discharge point such as an internal soil and vent stack internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used.

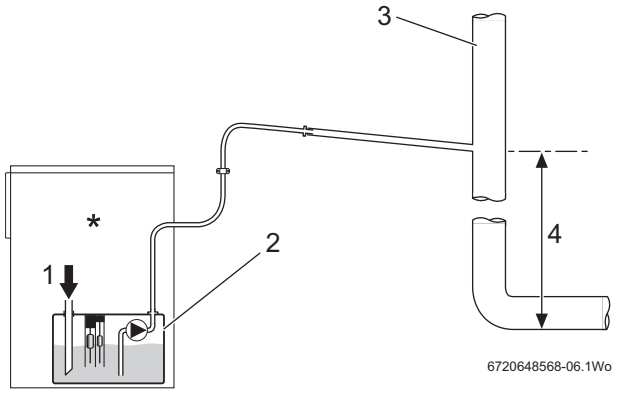


Fig. 5 Disposal to soil vent stack

Alternatively if the first option is not possible an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. can be used. Ensure that the condensate drain pipe is connected "down stream" of the waste trap.

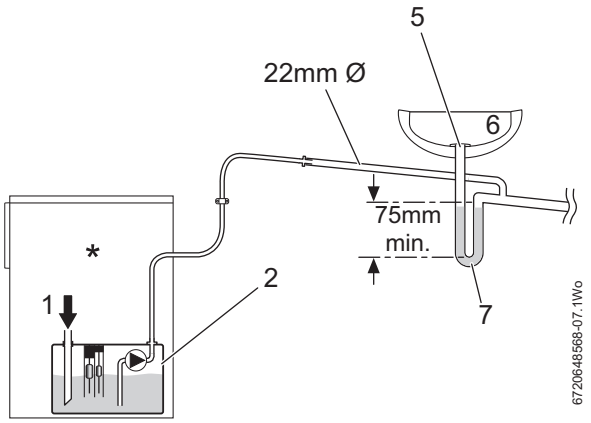


Fig. 6 Disposal to a waste pipe

3.4.2 External connections

NOTICE: Freezing conditions
- When the position of the boiler prevents internal routing, we recommend installing a CodenseSure siphon to significantly reduce the risk of freezing.
- Pipe work length should be kept to a minimum and the route as vertical as possible.
- Weather proof insulation must be used.

NOTICE: Condensate waste
- Care should be taken when siting a soak-away to avoid obstructing existing services.

Continued - Key to condensate illustrations	
8	Pipe work transition
9	Insulate and increase pipe size
10	External rain water pipe into foul water
11	External air break
12	Air gap
13	PVCu strap on fitting
14	43mm 90° male/female bend

Table 13

If no other discharge method is possible then the use of an externally run condensate drainage pipe terminating at a suitable foul water discharge point, or purpose-designed soak away, may be considered. If this method is chosen then the following measures should be adopted:

- Use a CondenseSure siphon to help prevent the condensate freezing.
- The external run be kept as short as possible and not exceed three metres.
- The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to 32mm before it passes through the wall to the exterior. The pipe should be insulated using suitable waterproof and weather resistant insulation.
- The external pipe should take the shortest and least exposed route to the discharge point, and should "fall" as steeply as possible away from the boiler, with no horizontal runs in which condensate might stand.
- The use of fittings, elbows etc. should be kept to a minimum and any internal “burrs” on cut pipe work should be removed so that the internal pipe section is as smooth as possible.

FITTING AN EXTERNAL AIR BREAK

- Refer to figure 7 when a rain water down pipe is used to dispose of condensate.
- An air break must be installed in the 43mm pipe work, between the boiler condensate outlet and the drainpipe, outside the property, to avoid flooding during adverse weather conditions.

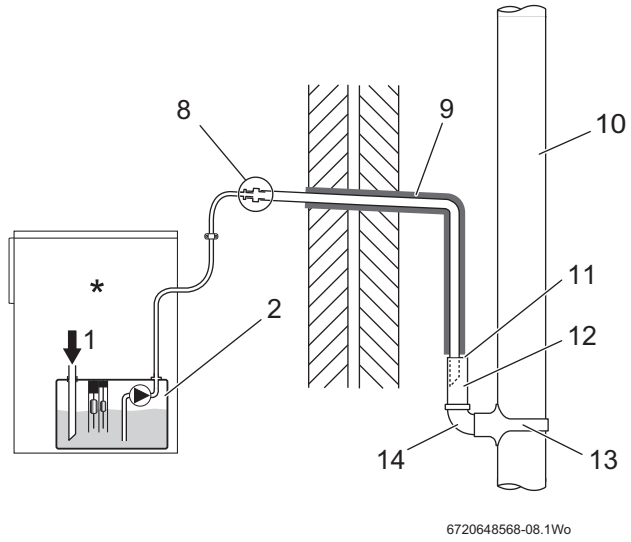


Fig. 7 Disposal into a rainwater down pipe

Condensate drainage pipe can be run above or below ground.

Where the pipe terminates over an open drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise “wind chill” at the open end.

The use of a drain cover (such as those used to prevent blockage by leaves) may offer further protection from wind chill.

Pipe drainage will be improved if the end is cut at 45° as opposed to a straight cut.

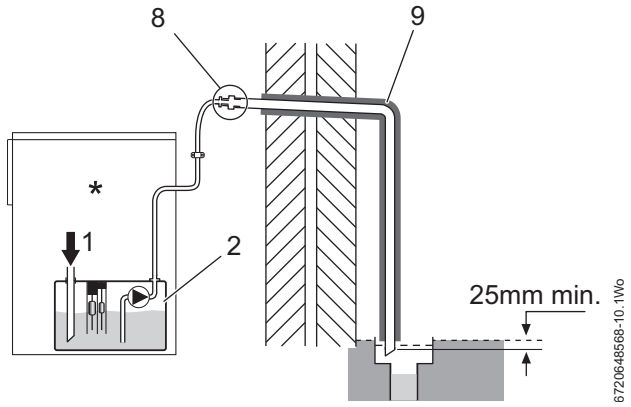


Fig. 8 External disposal

Continued - Key to condensate illustrations	
15	100mm Ø minimum plastic pipe
16	Drainage holes
17	Limestone chippings
18	Bottom of sealed tube

Table 14

CONDENSATE SOAK AWAY

- The condensate drainage pipe may be run above or below the ground to the soak away. The examples shown on this page run above ground.
- The soak away must use a 100mm Ø plastic tube with two rows of three 12mm holes on 25mm centres and 50mm from the bottom of the tube. The holes must face away from the house.
- The tube must be surrounded by at least 100mm of limestone chippings to a depth of 400mm.

Minimum hole size for the condensate soak away must be 400mm deep by 300mmØ .

In situations where there are likely to be extremes of temperature or exposure, the use of a proprietary trace-heating system for external pipe work, incorporating an external frost thermostat, should be considered. If such a system is used, the requirement to use 32mm pipe does not apply. However, all other guidance above and the instructions for the trace heating system, should be closely followed.

NOTICE: Unheated internal areas.

▶ Internal pipe runs in unheated areas such as lofts, basements and garages should be treated as external runs.

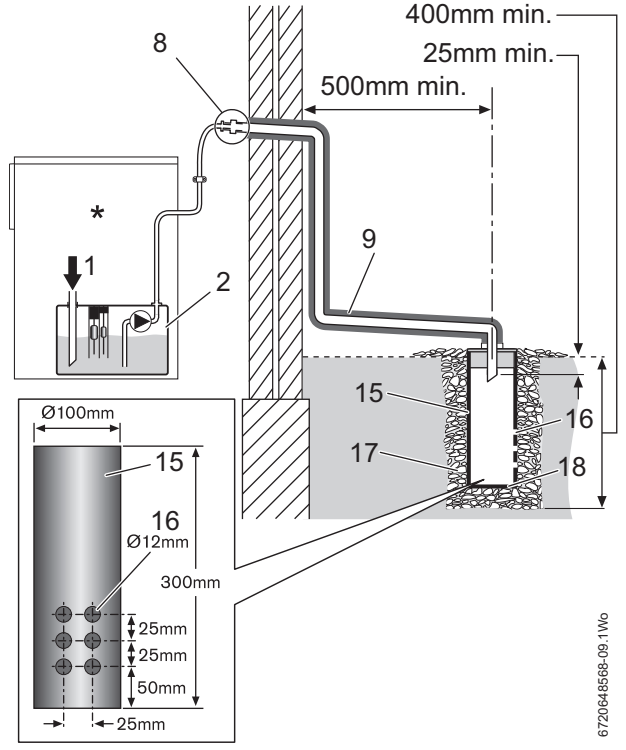


Fig. 9 Soak away

3.5 Pressure relief pipe work

NOTICE: Debris from the system can damage the boiler and reduce efficiency. Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance warranty.

- The pressure relief drain pipe (1) should be at least 15 mm diameter copper pipe and run downwards away from the boiler and discharge away from any electrical or other hazard, preferably to an external drain or soakaway.
- Pipe (3) should be finished with a partial bend, near the outlet to face the external wall (as shown) to help prevent freezing.

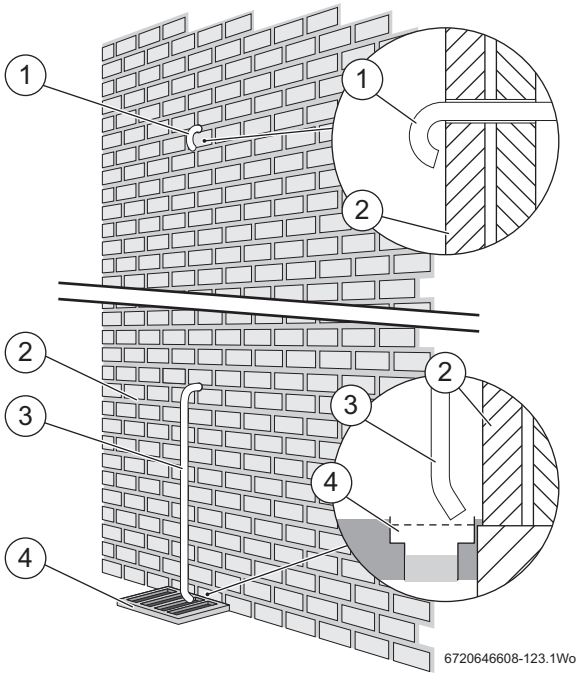


Fig. 10 Pressure relief pipe work

[2] Outside wall
[1, 3] Drain pipe
[4] External drain

3.6 Boiler location and clearances

- This boiler is only suitable for installing internally within a property at a suitable location onto a fixed rigid non-combustible surface at least the same size as the boiler and capable of supporting the boiler weight.
- The boiler is not suitable for external installation unless a suitable enclosure is provided.

COMMERCIAL INSTALLATION:

- If installing more than one appliance in a modular or cascade arrangement in a commercial premises, that total more than 70kW, then additional ventilation is needed to comply with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).

Compartments:

Follow the requirements of BS6798 and BS5440 Part 2 and note:

- Minimum clearances must be maintained.
- An access door is required to install, service and maintain the boiler and any ancillary equipment.
- If fitting the boiler into an airing cupboard use a non-combustible perforated material (maximum hole sizes of 13 mm) to separate the boiler from the airing space.

1: INSTALLATION CLEARANCES:

The dimensions below are the minimum space required to install the boiler only.

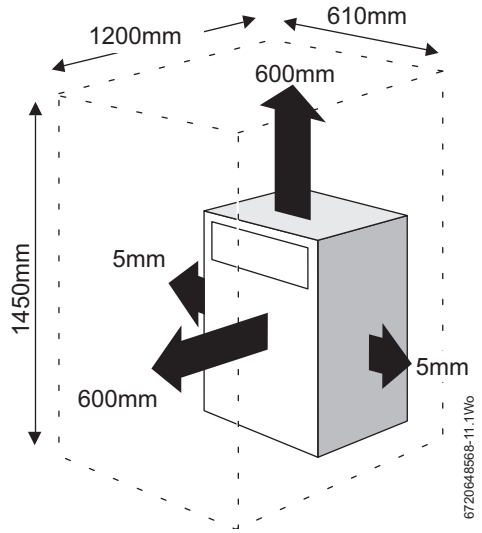


Fig. 11 Installation clearances

2: SERVICE CLEARANCES:

The dimensions below are the minimum space required to service the boiler only.

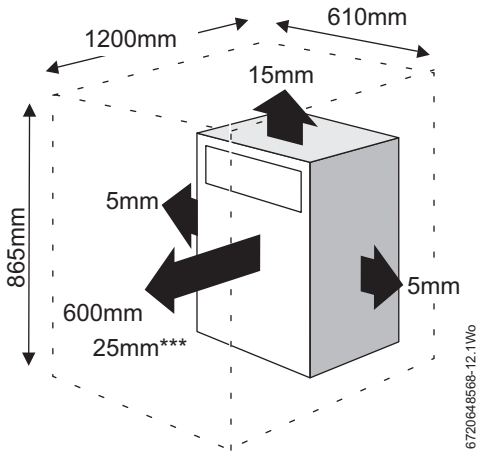


Fig. 12 Service clearances

[***] 25mm to a removable door

3: UNVENTED COMPARTMENT CLEARANCES:

The dimensions below show the minimum space required to install and service the boiler inside an unvented compartment.

*Space required for unvented areas with a removable door or panel.

This space can be reduced to 50mm for **one side only as long as both the side clearances add up to the total of both the side measurements shown or more.

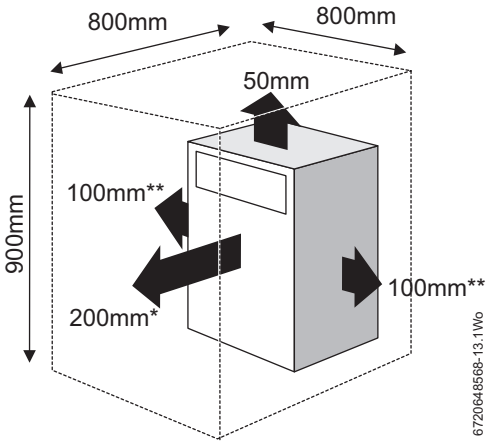


Fig. 13 Unvented compartment clearances

4: AIRING CUPBOARD CLEARANCES:

The dimensions below show the minimum space required to install and service the boiler within an airing cupboard.

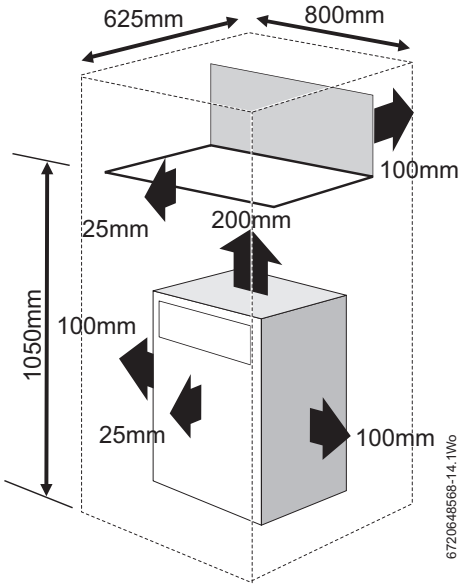


Fig. 14 Airing cupboard clearances

5: VENTING COMPARTMENTS:

If the clearances are less than those stated for options '3' & '4' (above) then ventilation must be provided as described in BS 5440.

A minimum of 2 air vents (C) of equal size must be fitted, one at low level and another at high level on the same wall using the same air for circulation.

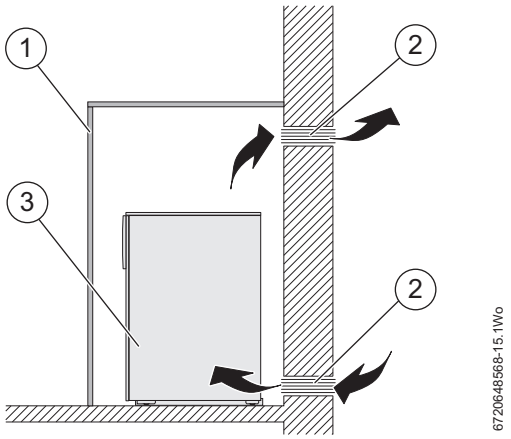


Fig. 15 Venting compartments

Minimum free area required for venting:

For area directly from outside:
440CDi ^{ErP} 155cm^2
550CDi ^{ErP} 220cm^2

For air from internal space/room:
440CDi ^{ErP} 310cm^2
550CDi ^{ErP} 440cm^2

6: BATHROOMS:

NOTICE: Any switch or appliance control using mains electricity must not be within reach of a person using the bath or shower.

A boiler fitted with a mechanical, RF mechanical timer, or a clip-in weather compensating controller may only installed outside the shaded area.

A boiler fitted with any other timer (or blanking panel) can be installed in zone 2.

Additional RCD (Residual Current Device) protection may be required.

Refer to the latest IEE wiring regulations.

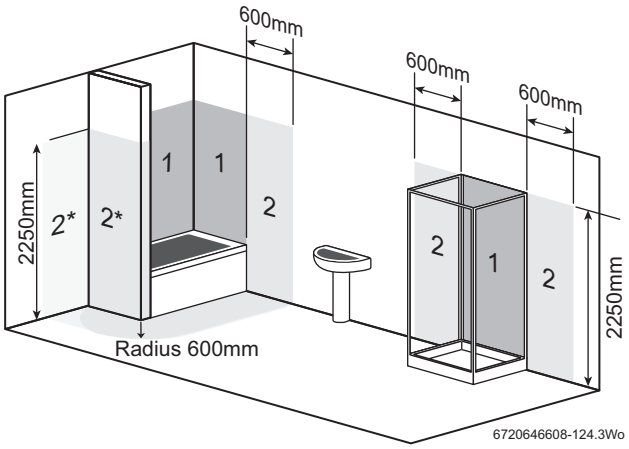


Fig. 16 Bathroom installations

3.7 Flue terminal positions

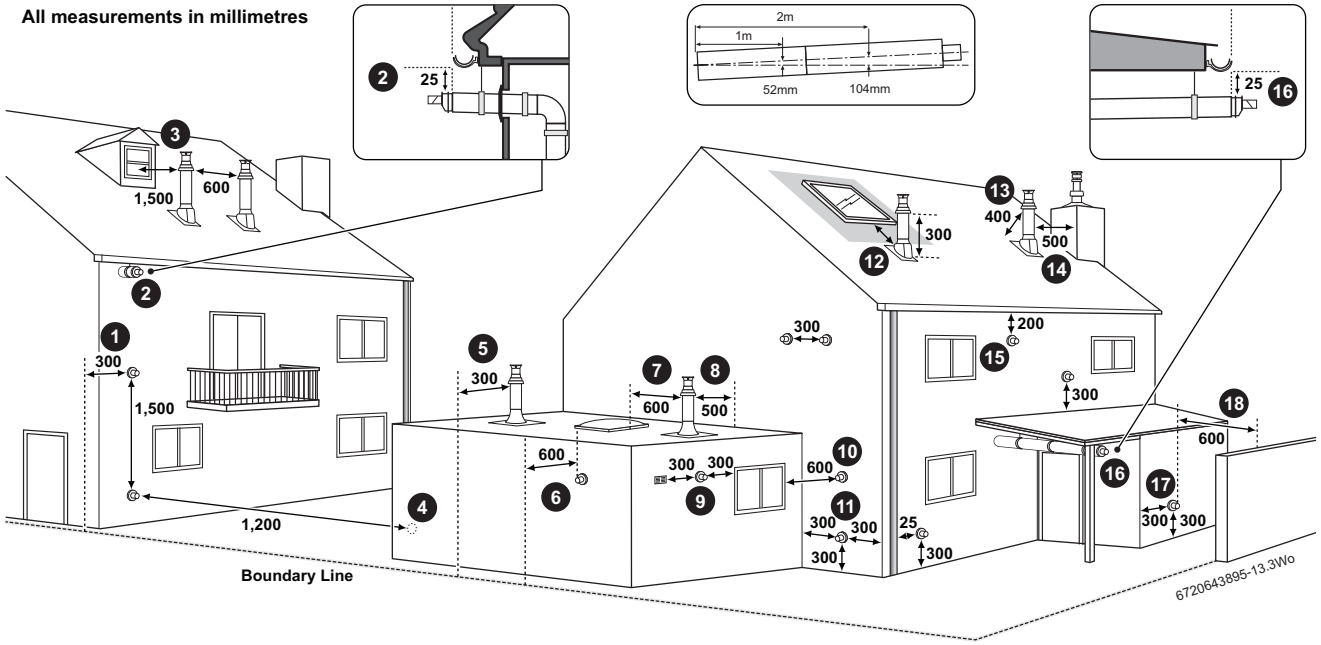


Fig. 17 Flue terminal positions

NOTICE:

- All measurements are the minimum clearances required.
- Terminals must be positioned so to avoid combustion products entering the building.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings. (flue bracket 100mm part number: 7 716 191 177, flue brackets 100mm x 6 part number: 7 716 191 178, flue bracket 125mm part number: 7 716 191 179).

Key to illustration

1. 300mm adjacent to a boundary line.
2. The dimension below eaves, gutters, pipes and drains can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
3. 1,500mm between a vertical flue terminal and a window or dormer window.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent to a boundary line unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines
6. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
7. 600mm minimum clearance from a skylight to a vertical flue.
8. Vertical flue clearance, 500mm to non-combustible building material, and 1,500mm clearance to combustible building material.
9. 300mm above, below and either side of an opening door, air vent or opening window.
10. 600mm diagonally to an opening door, air vent or opening window.
11. 300mm to an internal or external corner.
12. 2,000mm below a Velux window, 600mm above or to either side of the Velux window.
13. 400mm from a pitched roof or 500mm in regions with heavy snow fall.
14. 500mm clearance to any vertical structure on a roof, 600mm to room sealed flue or 1,500 to an open flue.
15. 200mm below eaves and 75mm below gutters, pipe and drains.
16. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. External flue joints must be sealed with suitable silicon sealant.
17. Flue clearance must be at least 300mm from the ground. Terminal guards must be fitted if the flue is less than 2 metres from the ground or if a person could come into contact with the flue terminal.
18. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.

Note:

- Installations in car ports are not recommended.
- The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.

3.8 Flue options

CAUTION: Non accessible flue systems:
- Where a flue system is not going to be accessible, provision must be made for service and inspection.
- Voids containing concealed flues must have at least one inspection hatch no less than 300mm square.
- Flue joints within the void must not be more than 1.5 metres from the edge of the inspection hatch.
- Inspection hatches should be located at changes of direction.
- If this is not possible, bends should be viewable from both directions.

NOTICE: Effective flue lengths:
- each 90° bend used is equivalent to 1.5 metres of straight flue
- each 45° bend used is equivalent to 0.75 metre of straight flue

Plume management kits are available for the 60/100 horizontal flue system,
Part number 7 716 191 086.
Refer to the manual supplied with the Plume Management kits for complete installation instructions

Condensfit II FLOOR STANDING

Highflow CDi boilers		Maximum total flue length L (mm)	
FLUE TYPE		60/100	80/125
1	Telescopic horizontal flue assembly	140[1] - 530	350 - 1,200
2	Horizontal flue extension	4,000	13,000
3	Horizontal flue with 1 x 90° bend	2,000	11,000
4	Horizontal flue with 2 x 90° bends	N/A	9,000
5	High level horizontal flue	2,000	11,000
6	High level horizontal flue with 2 x 90° bends	N/A	9,000
7	High level horizontal flue with 3 x 90° bends	N/A	7,000
8	Vertical balanced flue assembly	6,400	15,000
9	Vertical balanced flue with 2 x 90° bends	2,400	11,000
10	Vertical balanced flue with 2 x 45° bends	4,400	13,000

Table 15 Flue options

1) The flue is cut to a minimum of 130mm the flue connector adds the additional 10mm.

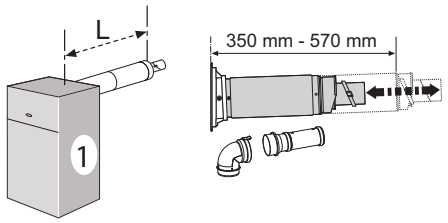
The flue systems have different maximum flue lengths

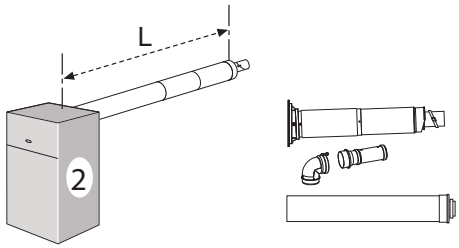
The next page shows various fluing options.

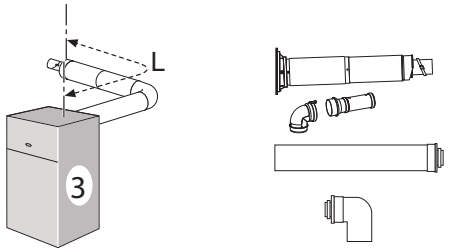
Refer to the Flue options in table 15 for the straight flue lengths required to achieve the maximum flue length.

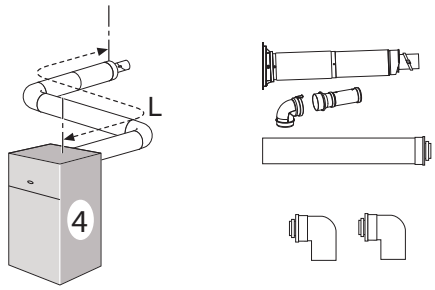
Part number	Flue	Description
7 716 191 155	60/100	Telescopic horizontal flue assembly
7 716 191 157	80/125	Telescopic horizontal flue assembly
7 716 191 156	60/100	Vertical flue assembly
7 716 191 158	80/125	Vertical flue assembly

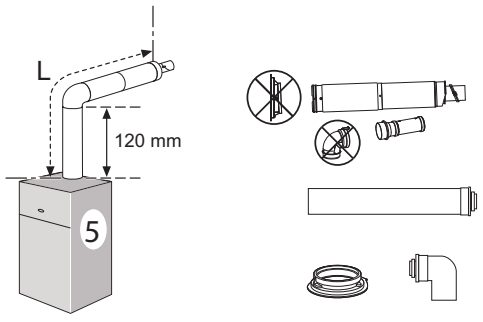
Table 16 Flue options

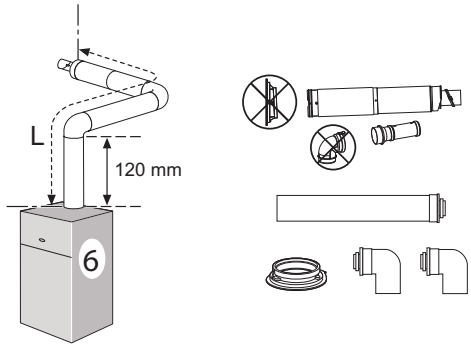


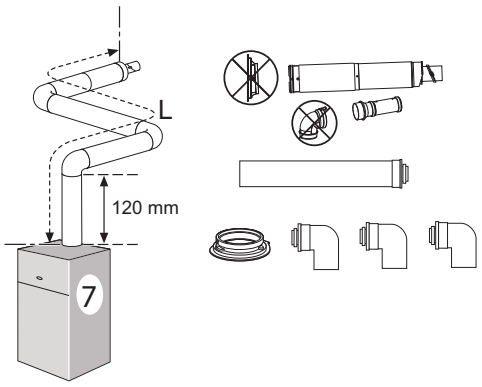


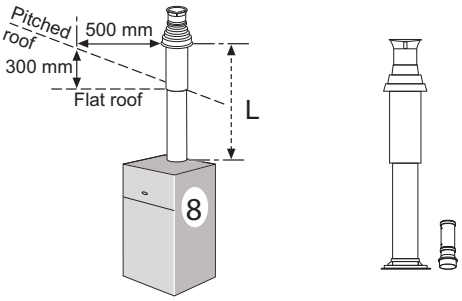


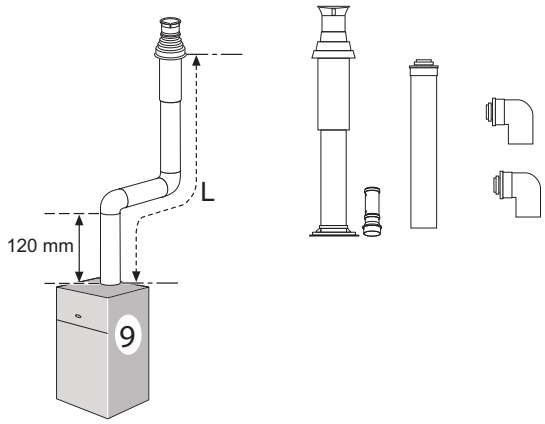


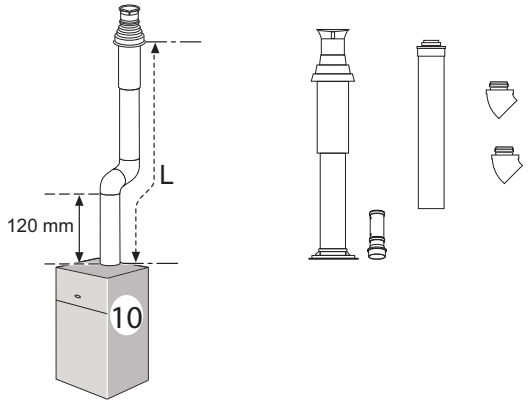












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3.9 Plume management terminal positions

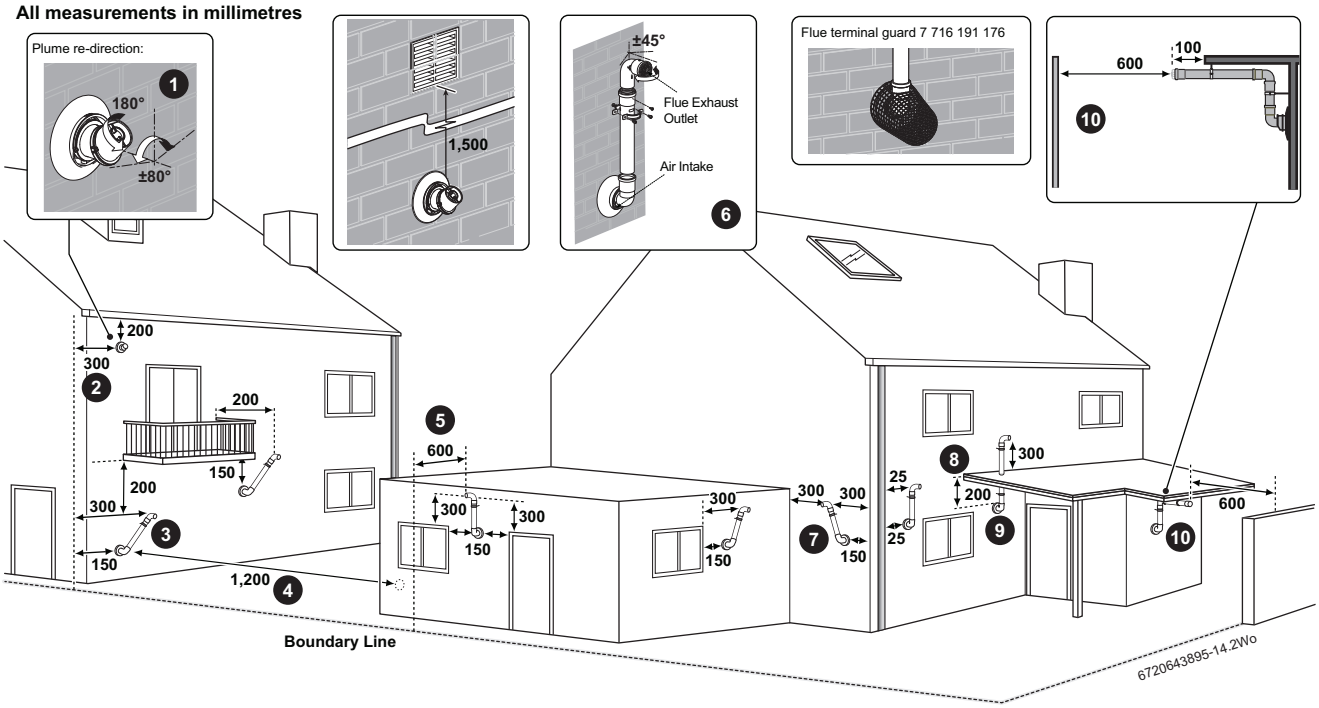


Fig. 18 Plume terminal positions

Maximum and minimum plume management lengths:

- A minimum distance of 500mm must be maintained between the plume management outlet and the flue air intake.
- The maximum plume management length is 4.5 metres for the appliances detailed on the front of this manual.
- The 45° bend is equivalent to 0.75 metres of straight plume management and the 90° bend is equivalent to 1.5 metres.

NOTICE:

- All measurements are the minimum clearances required.
- Refer to previous page for all concentric flue terminal positions unless the flue position is specified on the figure above “Plume terminal positions”.
- Terminals must be positioned so to avoid combustion products entering the building.
- Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings.

Key to illustration

1. This feature allows some basic plume re-direction options on a standard telescopic horizontal flue terminal.
   300mm minimum clearances to a opening e.g. window.
   However the minimum clearances to an opening in the direction that the plume management is facing, must be increased to 1,500mm.
   Where the flue is less than 150mm to a drainpipe and plume re-direction is used the deflector should not be directed towards the drainpipe.
2. 300mm adjacent to a boundary line.
3. Plume Management kit air intake can be reduced to 150mm providing the flue exhaust outlet is no less than 300mm adjacent to a boundary line.
4. 1,200mm between terminals facing each other.
5. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
6. Using a Plume Management kit the air intake measurement can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
   Plume kits running horizontally must have at least a 3° fall back to the boiler for proper disposal of condensate, except or the initial horizontal run from the terminal (refer to note opposite).

   For details on specific lengths see relevant boiler Technical and Specification information.
7. Internal/external corners. The air intake clearance can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
8. Clearances no less than 200mm from the lowest point of the balcony or overhang.
9. 1,200mm from an opening in a car port on the same wall e.g. door or window leading into the dwelling.
10. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.

Note:

- Installations in car ports are not recommended.
- The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.
- The initial plume kit horizontal run will have at least a 10° fall back to the boiler, due to the terminal elbow design, for proper disposal of the condensate.

4 INSTALLATION

CAUTION: ROOF SPACE
- THIS BOILER IS NOT SUITABLE FOR ROOF SPACE INSTALLATION.

NOTICE: Boiler start up
- All the previous Pre-Installation sections must be read and requirements met before starting boiler or flue installation.

4.1 Unpacking the boiler

NOTICE: BOILER HANDLING
- **At all times the correct method for handling heavy objects should be strictly observed.**
- **Take care not to damage the boiler panels or the floor.**
- The boiler may contain some water due to factory testing
- **Store the boiler in a dry area prior to installation**

Unpacking:

1. Undo the ties securing the carton to the pallet
   If a sharp implement is used, care must be taken not to pierce the carton or cause injury.
2. Before removing the carton it is advised that the top flaps are opened and the ancillary items (A, B, C & D) are removed and set to one side.
3. The carton can now be lifted off the boiler.

- Remove the plastic bag protecting the boiler surfaces and place safely away from the working area.
- Remove the two screws at the rear of the board securing the board to the pallet.

4. Grip the outer sides of the front panel pull and lift away from retaining lugs.

- Remove securing screw, at the front of the boiler, from the pallet.
- Remove remaining screws, at the rear of the boiler, from the pallet.
- The boiler is mounted on small wheels and two people are recommended to move the boiler from the board taking care not to damage the panels or the floor.
- Slide the boiler off the pallet.

5. Remove the rubber plug (E) from the boiler pipe work by pulling down.

GENERAL HANDLING GUIDELINES:
- Lift only a manageable weight, or ask for help.
- When lifting, bend the knees, and keep the back straight and feet apart.
- Do not lift and twist at the same time. Lift and carry items close to the body
- Wear protective clothing and gloves to protect from any sharp edges

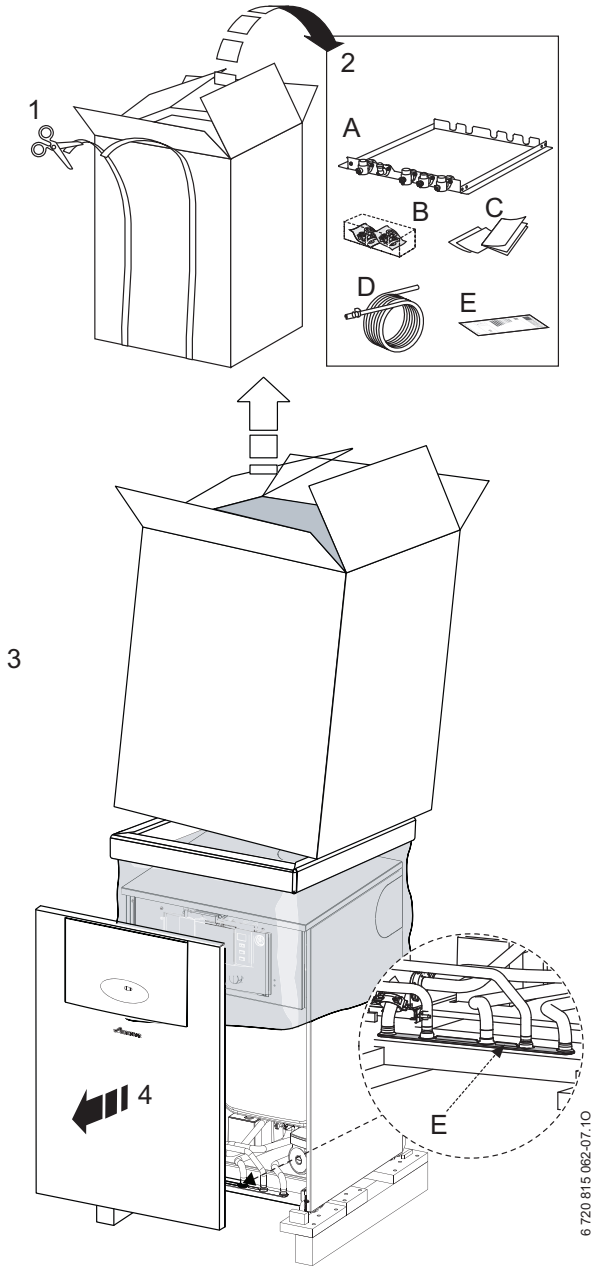


Fig. 19 Unpacking

A - Mounting frame
B - Installation pack
C - Literature pack
D - Condensate waste pipe and non-return valve
E - ErP energy label

4.2 Mounting frame fixing and flue opening

WARNING: Damage to property!
Damage caused by drilling into pipes, electrical cables, damp proof course or other hazards.
▶ Before drilling ensure that there are no obstructions.

Safety
All relevant safety precautions must be undertaken. Protective clothing, footwear, gloves and safety goggles must be worn as appropriate.

CAUTION: ISOLATE THE MAINS GAS SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

Running pipes behind the boiler:
- The frame should sit against the wall (not the skirting board) with enough room for the pipe work.
- Do not cross a pipe over another.
- The area around a rear flue outlet must be avoided.

GAS AND WATER CONNECTIONS
▶ Ensure all pipe work is clean and each pipe is in the correct position as shown opposite.
▶ Push in each pipe in turn and tighten the fitting to secure.

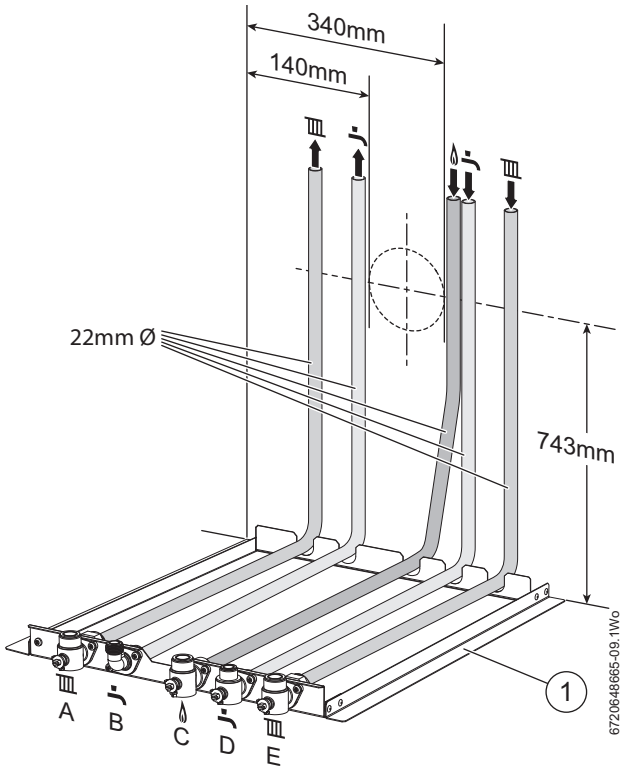


Fig. 20 Pipe locations

[1] Mounting frame.
[A] CH flow (22mm)
[B] DHW flow (22mm)
[C] Gas inlet (22mm)
[D] Mains water inlet (22mm)
[E] CH return (22mm)

Fixing the mounting frame
▶ Position the mounting frame (A) on the floor against the wall with manifold connections (B) facing away from the wall (D) ensuring there is enough space for the pipe work (E).
▶ Allow the minimum space from each side of the frame (A) for the boiler overhang (F) and minimum service clearance, as shown.
▶ Ensure the mounting frame is level and mark fixing points (C).
▶ Secure mounting frame (A) to the floor using appropriate fittings (not supplied).
▶ Clear any debris from the site.

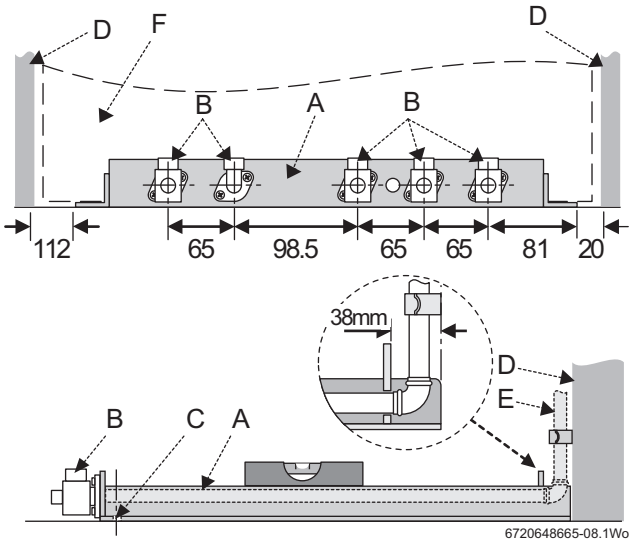


Fig. 21 Pipe positioning

[A] Mounting frame.
[B] Manifold connections.
[C] Mounting frame fixing point.
[D] Wall.
[E] Gas and water pipe work (not supplied).
[F] Boiler.

Flue opening
▶ Follow the figure 22, page 23 to mark the centre of the flue (1 & 2) for rear opening, (2 & 3) for side opening or (1 & 4) for top opening. Measurements shown include the minimum service clearances.

All horizontal flue sections must rise away from the boiler by 52mm per metre to ensure that condensate flows back into the boiler for safe discharge via the condensate waste pipe.

▶ Cover the mounting frame manifold assembly (A), figure 21, page 22 to protect the manifold connections.
▶ Make an opening (X or Z) through the wall using a core drill or similar at a size relative to the wall thickness as shown below:

Wall thickness	Flue opening 60/100mmØ	Flue opening 80/125mmØ
150 - 240mm	127mmØ	152mmØ
240 - 330mm	127mmØ	152mmØ
330 - 420mm	127mmØ	162mmØ
420 - 500mm	140mmØ	162mmØ

Table 17

Where the flue terminal can only be fitted from inside the building, increase the opening to 150mmØ to allow the optional weather collar to fit through the opening for 60/100 flue.

▶ Clear away any debris.

All dimensions in millimetres

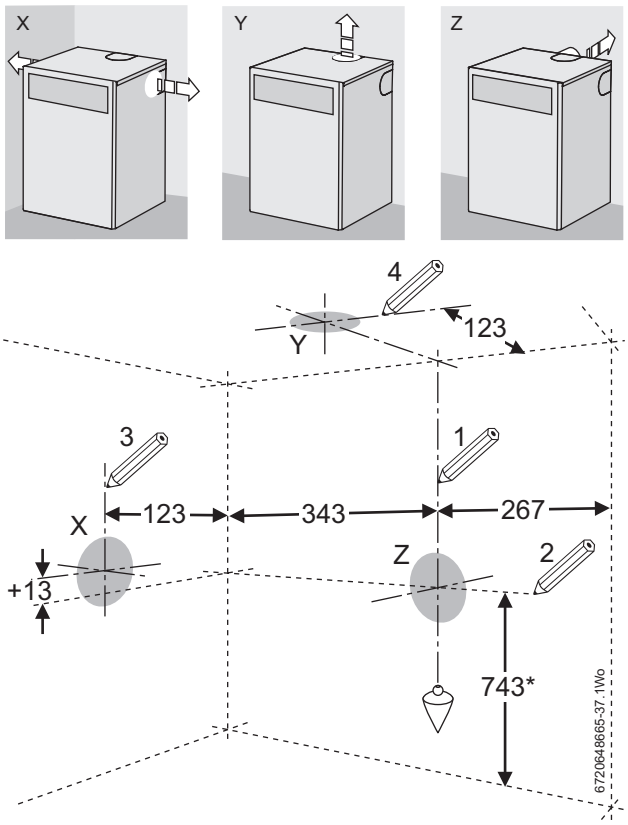


Fig. 22 Boiler flue outlet positions

4.3 Flue measuring and cutting

NOTICE: FLUE LENGTH

- Do not exceed the maximum straight length for a horizontal 60/100mm flue or a 60mm plume management system (if used) as stated in the relevant Installation, Commissioning and Servicing Instructions manual or addendum.

Cutting the flue to an exact measurement is not normally required as the telescopic flue terminal can allow for some adjustment.

Maximum effective flue lengths	L max. (mm)
HF 440/550 CDi ErP & FS 30/42 CDi ErP	4000

Table 18 Maximum flue lengths

Flue Length guide

Flue length range (mm)	Cut	Number of extensions
140[1] - 265	YES	None
310 - 530	NO	None
530 - 750	NO	None
750 - 1260	YES	1
1260 - 1480	NO	1
1480 - 2210	YES	2
2210 - 2430	NO	2
2430 - 3160	YES	3
3160 - 3380	NO	3
3380 - 4000	YES	4

Table 19 Flue extension guidance up to 4000mm

1) The flue is cut to a minimum of 130mm the flue connector adds the additional 10mm.

Access to combustion chamber for flue installation

1. Grip the outer sides of the front panel (A) pull and lift away from retaining lugs (B).
2. Remove retaining screw (C) to swing control panel assembly (D) outwards to its full extent.
3. Pull clip (E) outwards to release expansion vessel (F).
4. Swing expansion vessel (F) outwards.

For easier access to the inner case, the expansion vessel can be unhooked (by removing the retaining screw on the hinge) lowered and moved to the side. Take care not to overstretch the flexible pipe connections.

5. Release four screws (G) to remove the inner case cover (H).

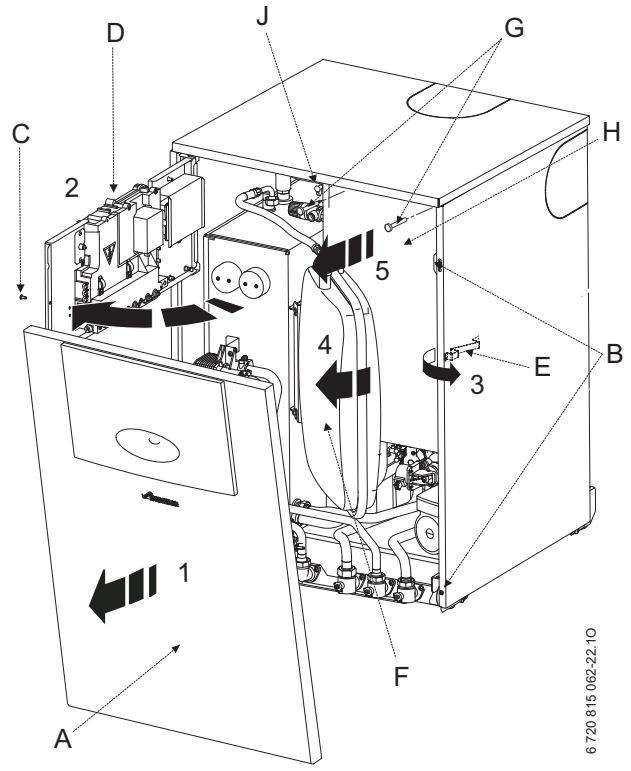


Fig. 23 Access for flue connection

4.3.1 Flue extension example

The terminal end projects beyond the outside wall by the distance shown in fig. 24

The flue adaptor sits flush against the outside of the inner casing.

1. Measure the flue length L from the inner face of the flue adapter, along the route of the flue system, to the face of the outside wall.
2. Select the required number of extensions and bends to achieve the require flue run.
3. If the flue requires cutting:
   - Set the telescopic flue length to 400mm.
   - Secure the joint with the screw and tape provided.
   - Subtract 400mm from the measured flue length L to determine the amount to be cut of an extension.

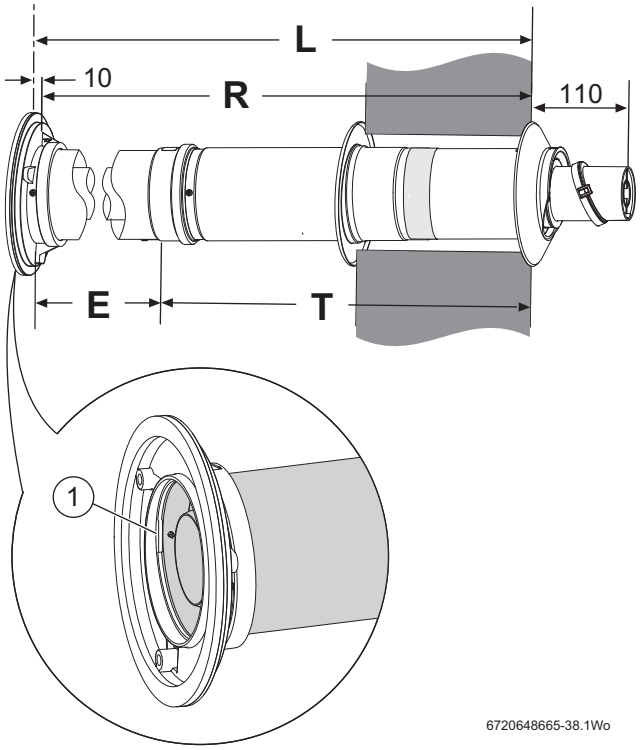


Fig. 24 Flue length determination

[1] Flue adaptor stop point
[L] Effective length of the flue system
[R] Actual length of the flue sections (L-10 = R)
[E] Extension flue length
[T] Telescopic flue length

FLUE BENDS

NOTICE: EFFECTIVE LENGTH

- Each flue bend is rated as a certain straight length of flue, refer to table 20, page 24 below. The “effective length” of each bend is added to the straight length of flue. Adding bends to the flue system reduces the actual flue length available.
  The effective length of the flue must not exceed that stated in the relevant appliance Installation, commissioning and service manual.

Bend	Effective length in millimetres HF 440/550 CDi ErP & FS 30/42 CDi ErP
90°	2000
45°	1000

Table 20 Effective length of bends

90° BENDS

Figure 25 shows the actual length added by a 90° bend when used in either orientation.

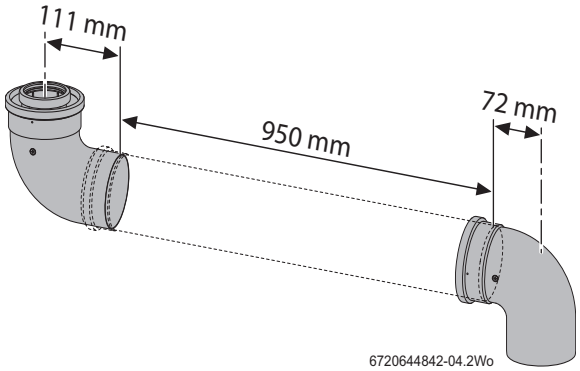


Fig. 25 90° Bend offset dimensions

aDJUSTING THE TELESCOPIC FLUE LENGTH:

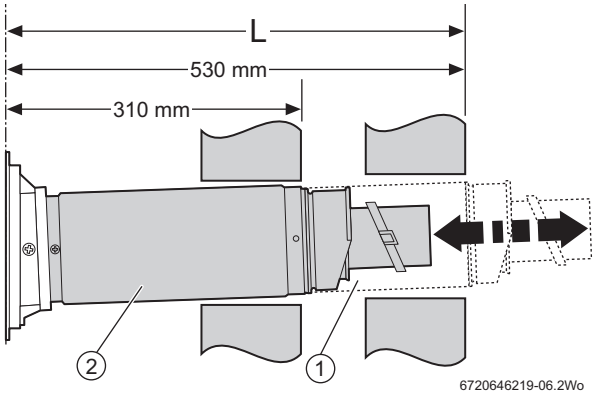


Fig. 26 Standard telescopic flue

Extend tube (1) by withdrawing from tube (2) to achieve the flue length required, between 310- 530mm.

Secure with screw provided and seal joint with the aluminium tape supplied.

REDUCING THE TELESCOPIC FLUE LENGTH

Ensure that the TOP label of both sections are aligned before securing the two parts at the required length.

The flue terminal MUST be fitted with the 'TOP' label uppermost to allow the correct fit and use of the plume management system.

1. Remove securing screws from horizontal flue connector (1) to detach the terminal assembly.
2. Slide terminal section (2) from the terminal assembly and discard.
3. To use terminal (3) without cutting, remove the location lug (4), figure 28 on the inner flue tube (5), figure 28 and remove any burrs.

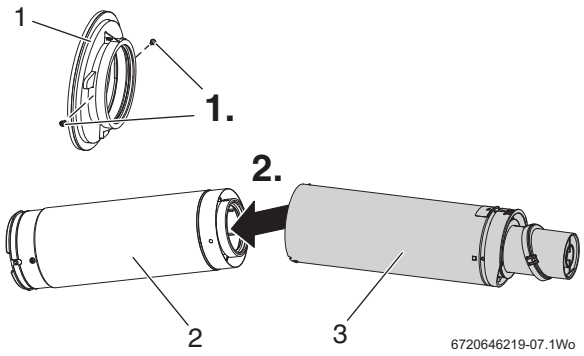


Fig. 27 Reducing the telescopic terminal

To reduce the telescopic flue length further:

- Mark the length required for the terminal as shown in figure 28 (min. 130mm) and cut square, taking care not to damage the tubes.
- Remove any burrs and chamfer the outer edge of the tubes to assist ease of connection and prevent seal damage.

The aluminium tape is not required when reducing the terminal.

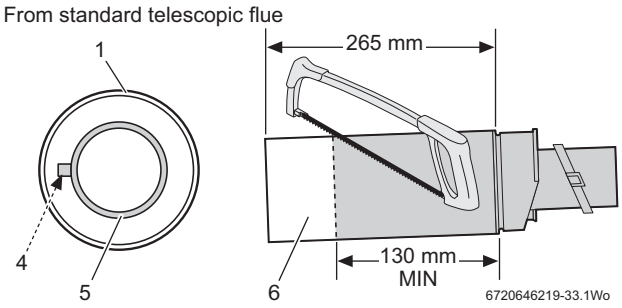


Fig. 28 Further reduction

REDUCING EXTENsion FLUE TUBE LENGTH

A 220mm short extension is available

- Mark the extension tube to the required distance, measuring from the socket end and cut the tube square, taking care not to damage the tubes.
- Remove any burrs and chamfer the outer edge of the tubes to ease the connection and prevent damage to the seals.

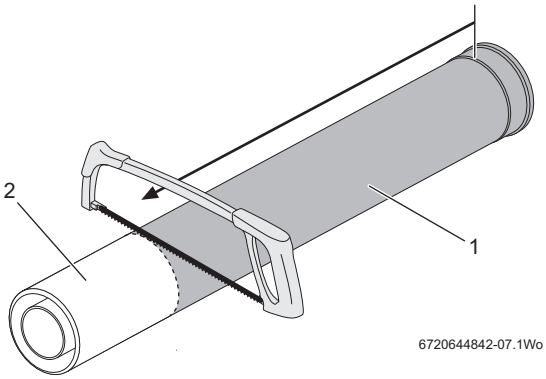


Fig. 29 Cutting an extension tube

FLUE OUTLETS

Depending on the flue exit point from the boiler it may be necessary to reduce the length of the adaptor, the details can be found in figure 31, page 25 and figure 32, page 26.

Flue configuration and adapter required		
1	Vertical	Unmodified adapter
2	Left exit	93° bend and shortened adapter
3	Right exit	93° bend and long adapter
4	Rear exit	93° bend and shortened adapter

Table 21

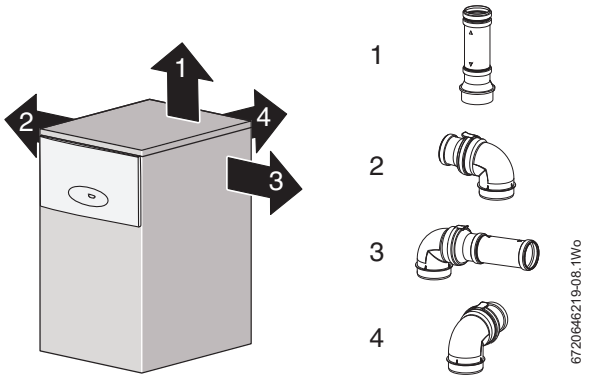


Fig. 30 Flue exit options

Cutting the flue adaptor

The flue adaptor must be cut to suit all **horizontal** fluing configurations.

1. Remove seal from flue adaptor.
2. Cut square to mark, as shown, deburr and clean.
3. Replace seal.

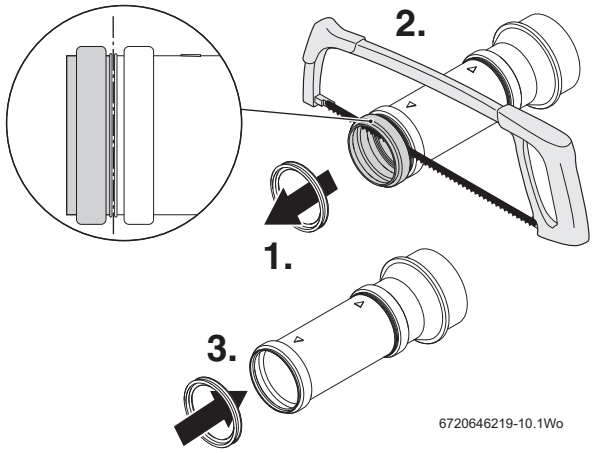


Fig. 31 Long adapter for horizontal flue

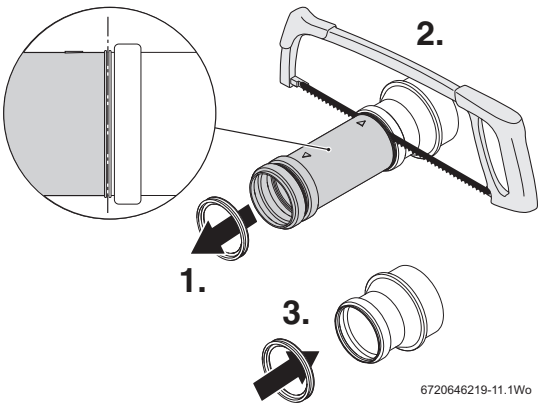


Fig. 32 Short adaptor horizontal flue

CONVERT FROM REAR FLUE OUTLET

The boiler is supplied ready to fit a rear flue outlet. To flue from the sides or top of the boiler, follow the procedure below:

1. Remove the required side or top 'knock-out' panel from the outer casing.
2. Undue the three screws.
3. Remove the flue outlet blanking plate comprising the cover and gasket from the inner casing.
4. Refit the outlet blanking plate over the rear flue outlet, making sure it seals.
5. Secure the blanking plate cover and gasket with the three screws.

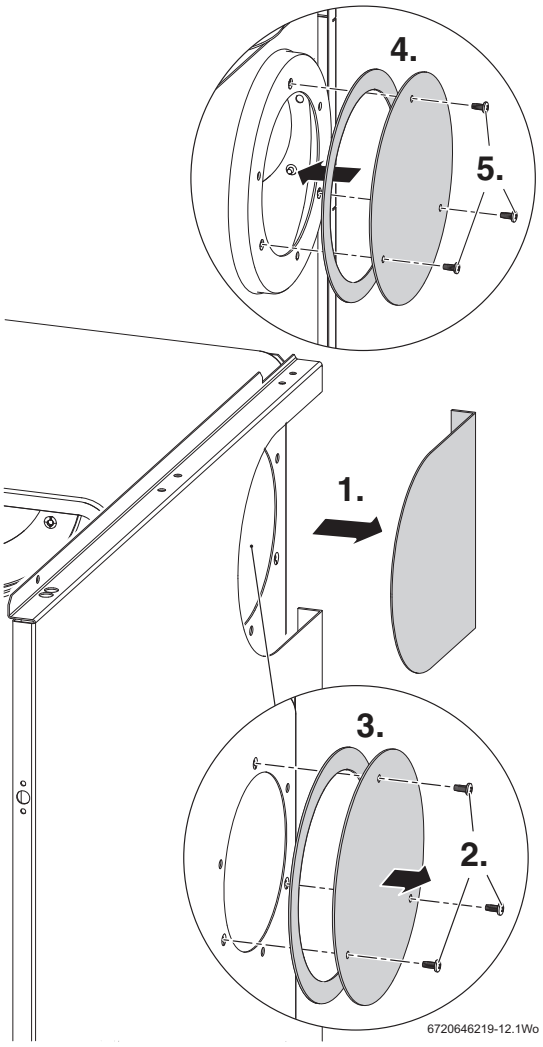


Fig. 33 Converting from rear to side flue outlet

4.4 Standard flue installation

To ease assembly of the flue components, grease seals lightly with the solvent-free grease supplied.

NOTICE:

- Check all the seals are seated properly in the grooves provided and are in good condition.
- All flue joints must be sealed to prevent leakage of condensate and flue products.

- When using a 100mm diameter flue, a 125mm diameter hole through the wall is required.
  However, if installing the flue from inside the property and fitting the weather sealing collar before the flue is pushed through the hole, then a 150mm diameter hole is required.
- The flue connector for the 100mm flue has an in-built 3° angle.
- If extensions are to be added then the complete flue must rise at an angle of 3° or 52mm for every metre of flue length.
- Drill the hole using a suitable core drill.

1. Set the flue terminal to the distance required, secure with screw
2. Seal the joint with the aluminium tape supplied.
3. Slide the inner wall seal onto the terminal as shown.
   If fitting from inside the building; slide the outer wall seal onto terminal.
4. Position terminal through the flue opening in the wall to the outside of the building by the distance shown.
   If fitting from the outside of the building; slide the outer wall seal onto terminal to fit against the outer wall.

The flue terminal MUST be fitted with the 'TOP' uppermost to allow the correct fit and use of the plume management system.

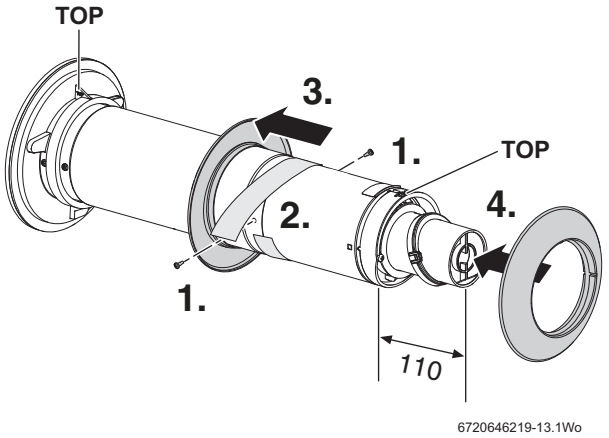


Fig. 34 Telescopic flue fitting

1. Roll the boiler into position on the floor mounting frame.
   Position connector (1) with 'TOP' uppermost to align with the three holes in the boiler inner casing.
2. Secure the connector (1) to the boiler case using 3 hexagonal bolts.

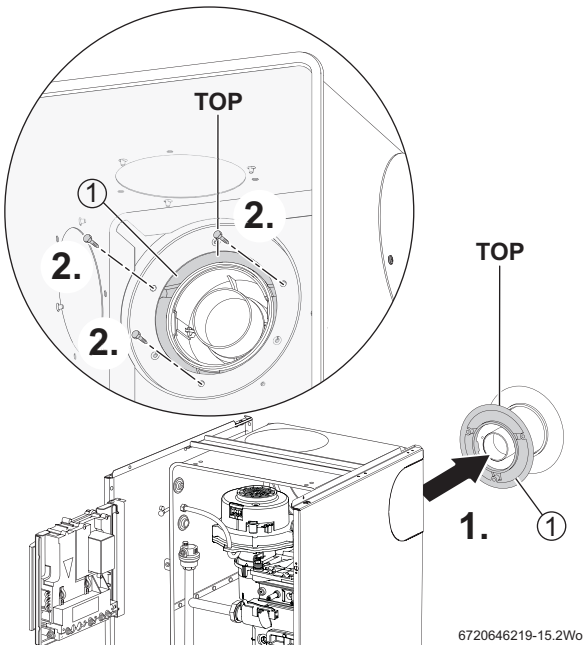


Fig. 35 Fitting flue outlet

Adapter/elbow assembly

1. Push-fit the adapter into the elbow until secured with the clip.

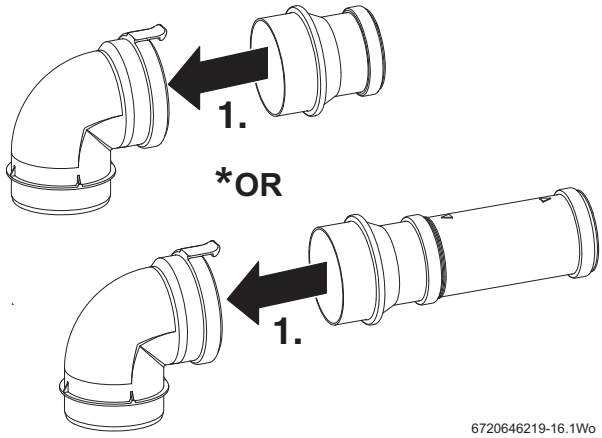


Fig. 36 Adaptor/elbow assembly

Fitting the adapter/elbow assembly

1. Slide the adaptor into the inner flue tube of the terminal.
2. Slide the elbow into the flue outlet (1), ensuring that the clips (2) secure the elbow into position.

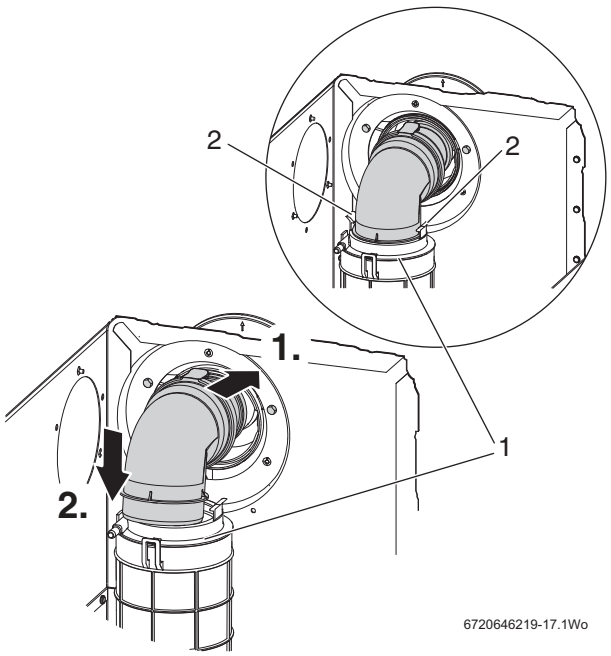


Fig. 37 Fitting the adaptor/elbow assembly

Horizontal low level flue exit

1. For horizontal, low level side entry flues,
2. Secure the flue adapter from inside the boiler case with the three hexagonal screws provided.

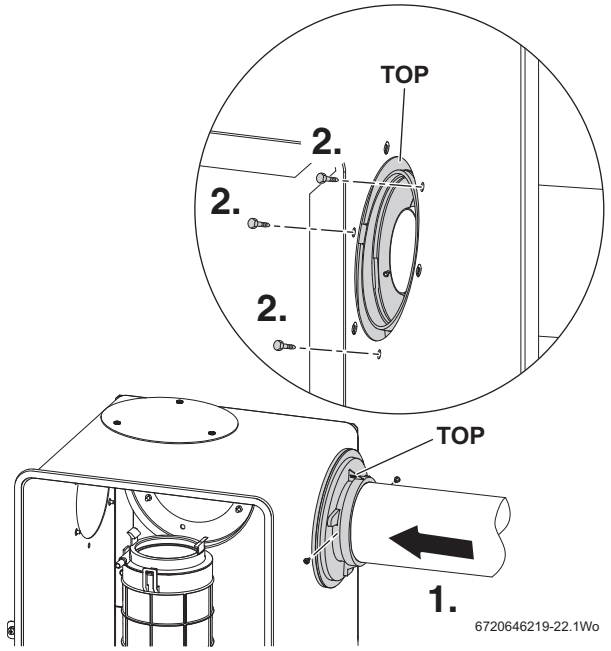


Fig. 38 Side flue fitting

1. Slide the adaptor into the inner flue tube of terminal as shown in figure 39.
2. Push the elbow into flue outlet until secured with the retaining clips (2) ensuring a good seal is made.

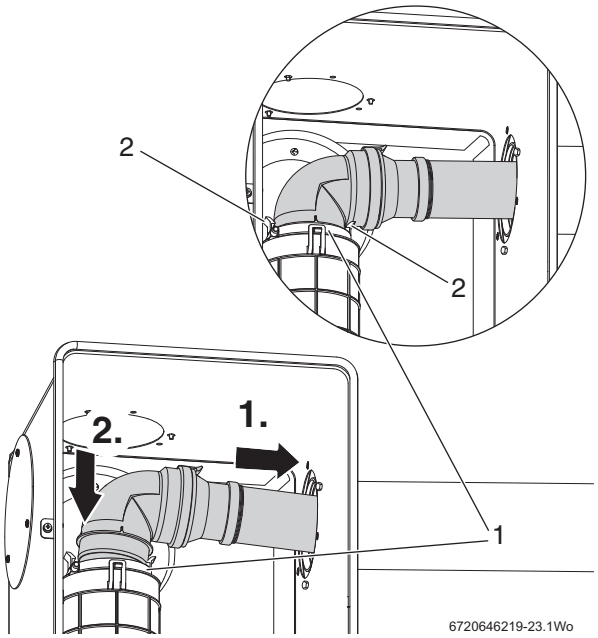


Fig. 39 Fitting the adaptor/elbow

4.5 Flue terminal plume re-direction

The flue discharge can be re-directed to allow some plume redirection control. Alternatively, a complete plume management system can be fitted to the flue terminal.

Re-directing the flue discharge

NOTICE: DO NOT ROTATE THE COMPLETE FLUE TERMINAL ASSEMBLY.

- The flue terminal outlet has built-in stops to limit rotation for horizontal fluing.
  This allows condensate to run back to the boiler for safe disposal.
  Do not attempt to force beyond the limit stops.

1. Using a suitable tool, unclip the end of the terminal.
2. Rotate the end by 180° and refit the terminal end, ensuring to engage the clips to secure.
3. Loosen the screws securing the entire outlet assembly and rotate by ± 80° to the desired position and re-secure the assembly.

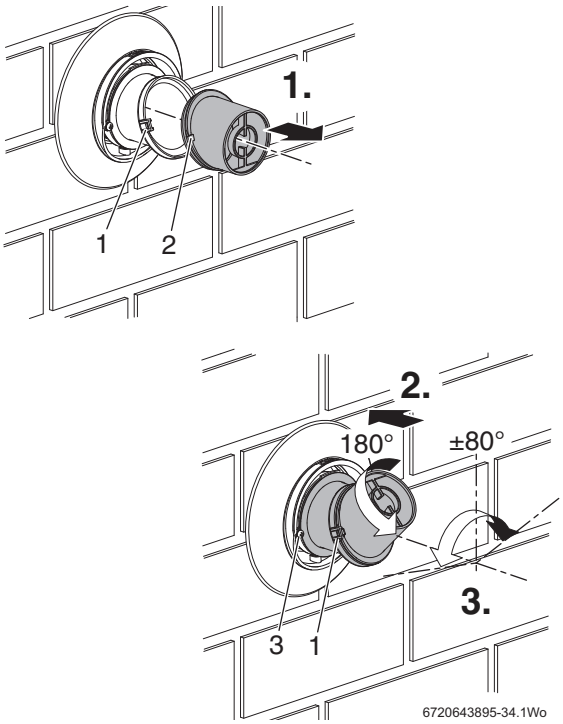


Fig. 40 Plume redirection

NOTICE: OUTLET POSITIONS

- The flue terminal outlet position must follow those stated in figure 17.
  When redirecting the flue discharge the terminal end must be at least 1500mm from any opening in the direction of the discharge to prevent combustion products from entering the building as shown

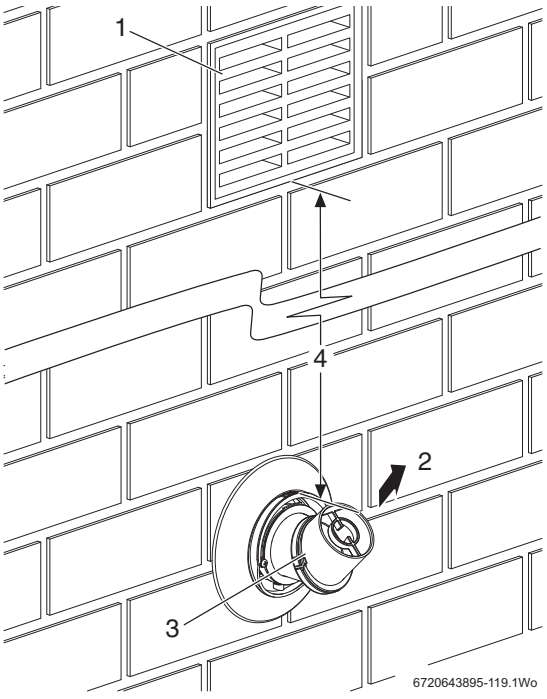


Fig. 41 Plume distance to opening

1	Opening in building
2	Flue discharge
3	Terminal end
4	Minimum 1500mm from an opening in the building

Table 22 Key to figure 41

4.6 Condensate, gas and water connections

CONDENSATE CONNECTION:

The condensate pump (G) fills up and periodically discharges through the flexible condensate pipe (H) between 200mm to 4500mm from floor level. After this point the condensate flows, due to gravity, down the 21.5mm plastic pipe to the outlet.

- Fit the bayonet connector on the end of the condensate waste pipe to the condensate pump. Push down and rotate clockwise until the connector is locked.
- Route and secure condensate waste pipe (H) with clips supplied to prevent kinking or restriction.
- Cut off any excess pipe (H).
- Fit the condensate waste pipe (H) to adaptor (K) and secure with clip (J).
- Connect adaptor (K) to 21.5mm plastic pipe and terminate into an internal waste trap.

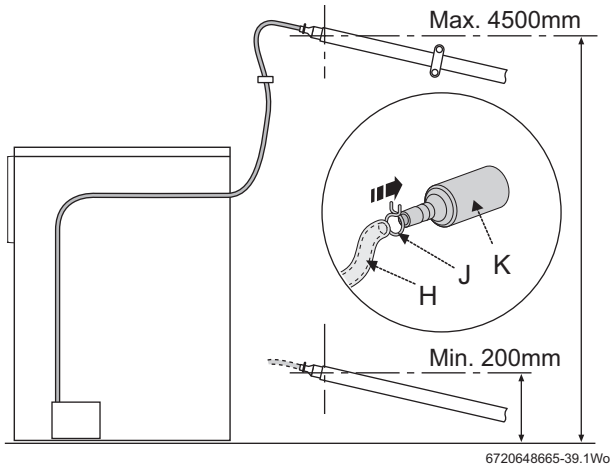


Fig. 42 Condensate connection

(See Pre-Installation section for condensate pipe work running from the adaptor (K) to the discharge outlet).

Never terminate or discharge into any open source, including; sink, bath, shower, bidet, toilet etc.

- Any external condensate pipe work should be protected with weather resistant insulation to help prevent freezing.
- The flexible pipe supplied can only be used inside the property.

CAUTION: ISOLATE THE MAINS GAS AND WATER SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

GAS AND WATER CONNECTIONS:

- Remove the transit bung (L) from the gas and water connections (A, B, C, D & E) on the boiler and mounting frame.

Surplus water may be present due to factory testing.

- Ensure the area is clear of debris and manoeuvre the boiler rear wheels onto the outer rails of the mounting frame (F).
- Take care when moving the boiler to position the front wheels onto the rails and align the gas/water connections and the flue.
- Secure boiler to mounting frame (F) with screw (M)
- Place the 5 larger valve sealing washers (shown shaded) onto valves A, B, C, D & E.
- Ensure all pipe work is clean.
- Tighten up the flat sealing connections to secure:
  A - CH flow (22mm).
  B - DHW flow (22mm).
  C - Gas inlet(22mm) (bonded washer).
  D - Mains water inlet (22mm).
  E - CH return (22mm).

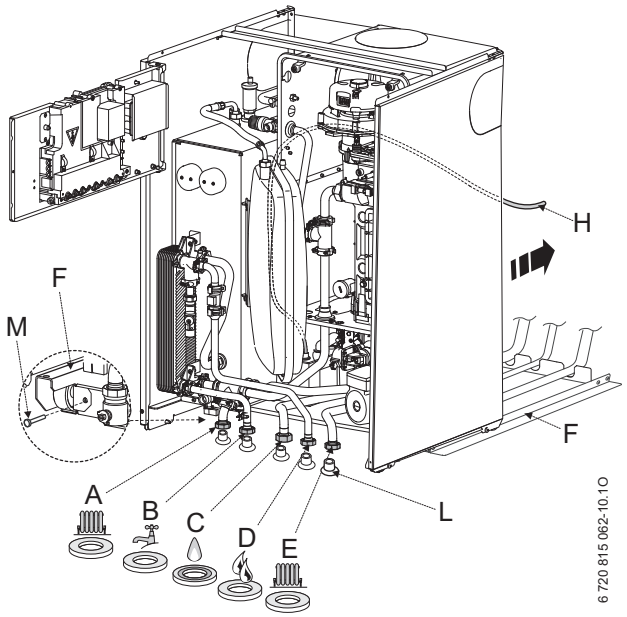


Fig. 43 Connections

4.7 Pressure relief valve outlet

Fitting the pressure relief valve drain pipe:

- Connect a length of 15mm copper pipe (A) to the PRV drain pipe (B). The PRV drain pipe (B) should be at least 15mm diameter and run down away from any electrical or other hazard.

NOTICE: The pressure relief valve is a safety device for the boiler and if activated may discharge boiling water or steam through the P.R.V drain pipe.

Auto air vent:

- Remove the auto air vent cap (C) and discard.

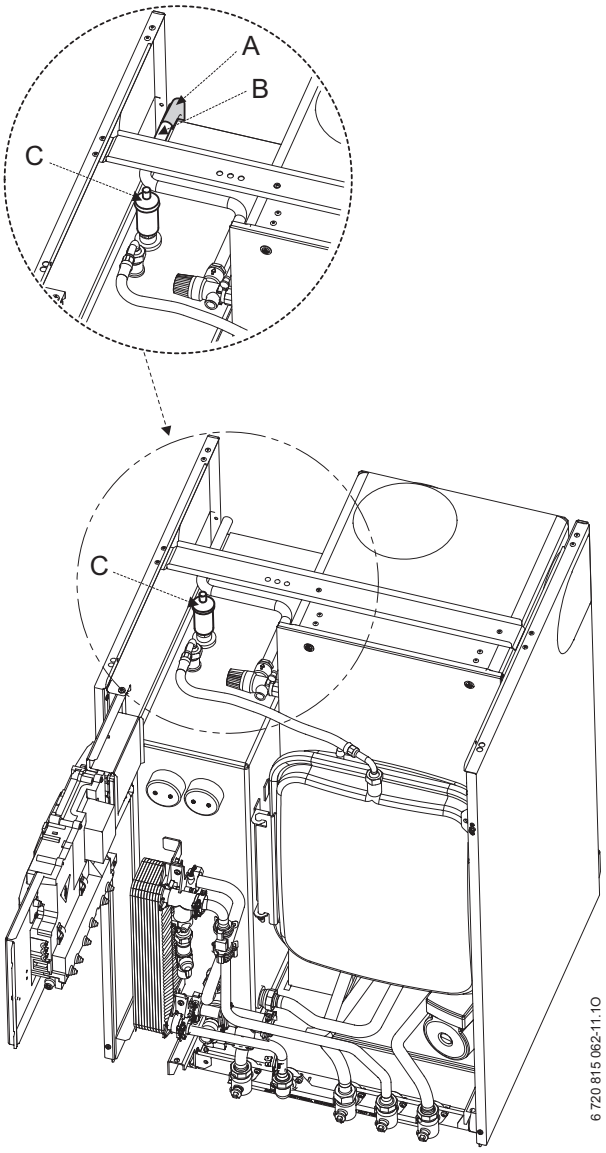


Fig. 44 PRV & AAV

4.8 Electrical

CAUTION: ISOLATE THE MAINS ELECTRICITY SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS

- The mains electrical supply to the boiler and system wiring centre must be common and through either a common fused double pole isolator or a fused three pin plug and unswitched socket.
- The isolator shall be sited next to the boiler for new systems and where practicable, replacement boilers.
- The isolator must have a contact separation of 3mm minimum between all poles. Any system connected to the boiler must not have a separate electrical supply.
- External fuse 3 Amps.
- When stripping wires ensure copper strands do not fall into the control box.

Access to electrical connections:

Remove boiler casing to access control panel.

1. Remove screw (A) and swing the control panel into the service position.

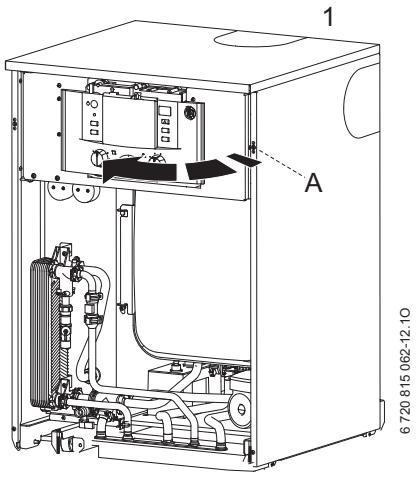


Fig. 45 Control box in service position

2. Remove the three screws (B) in the control panel and remove the connections cover.

- Remove the screw (C) and remove installer module cover (D).
- Remove Installer module plastic cover (E).

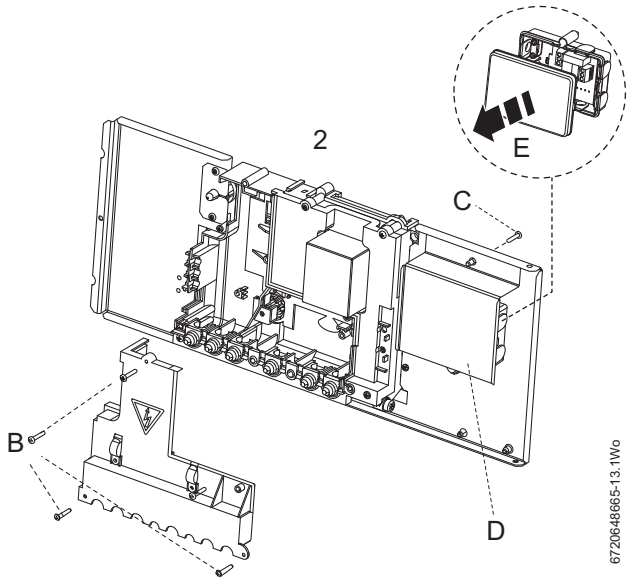


Fig. 46 Electrical connections access

3. Unclip cable clamp (F).
4. Cut off the tapered cable entry to suit the cable diameter.

5. Unscrew cable retaining screw (G). Run the cable through the cable clamp (F) ensuring there is ample cable to reach the connectors.
6. Tighten the cable retaining screw (G) to secure the cable and replace clamp (F) into the control panel.

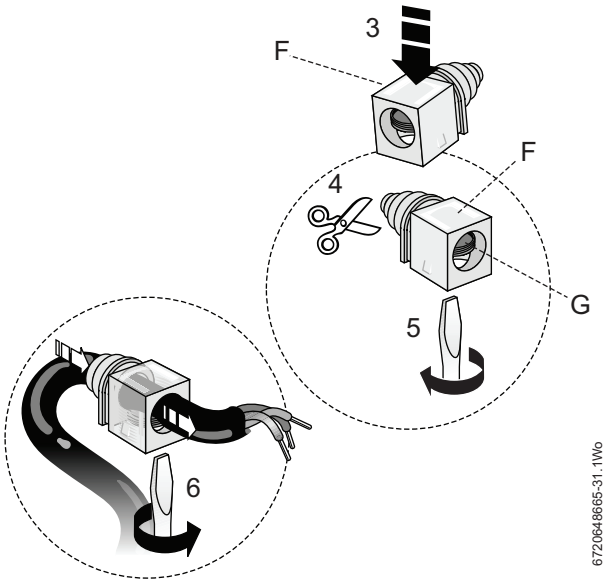


Fig. 47 Cable retainers

7. Mains power 230 Volt connection ST10:

- ▶ Separate wires from cable end and strip to 6mm
- ▶ Connect LIVE wire to terminal L
- ▶ Connect NEUTRAL wire to terminal N
- ▶ Connect EARTH wire to connector

Make the EARTH wire longer so that if the cable is snagged, the EARTH wire is the last to be pulled out.

8. Optional frost thermostat connection ST6:

- ▶ Connect frost thermostat supply wire to terminal Fs
- ▶ Connect frost thermostat return wire to terminal FR

9. 230V room thermostat and/or external timer ST10:

- ▶ Remove link
- ▶ Connect room thermostat LIVE supply to terminal Ls
- ▶ Connect room thermostat LIVE return to terminal LR
- ▶ Connect room thermostat NEUTRAL to terminal Ns

10. Installer module for DHW timing

- ▶ Connect external timer NEUTRAL to top terminal
- ▶ Connect external timer DHW ON to bottom terminal
- ▶ Refit all panels

Refer to manufacturers instructions when connecting external parts to the boiler.

Worcester, Bosch Group cannot be held responsible for wiring errors.

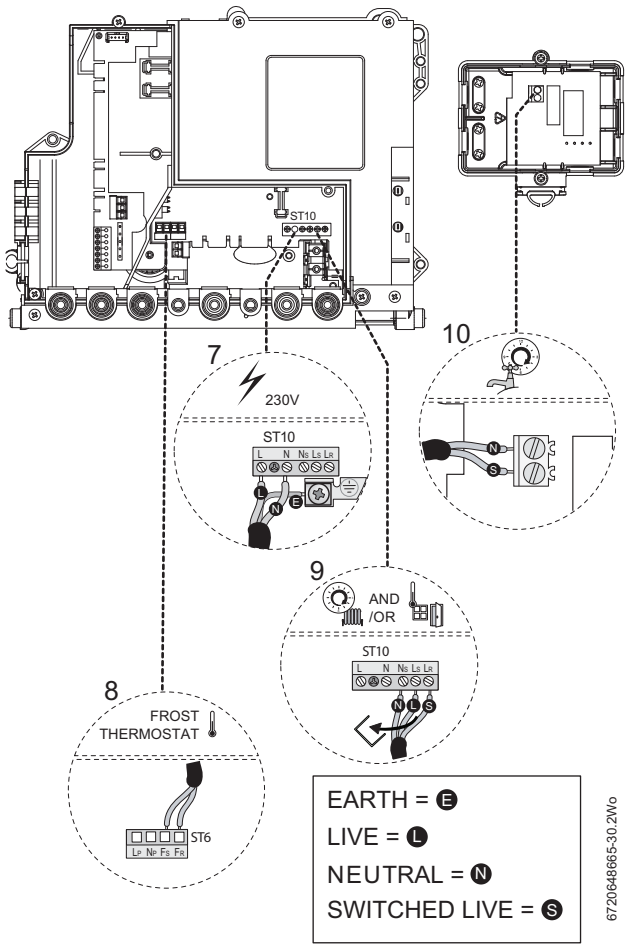


Fig. 48 PCB connections

5 COMMISSIONING

5.1 Pre-commissioning checks

CAUTION: Isolate the mains supplies before starting any work and observe all relevant safety pre-cautions.

1. Check that the service and water pipes are connected to the correct valve on the manifold;
   A - CH flow (22mm)
   B - DHW flow (22mm)
   C - Gas inlet (22mm)
   D - Mains water inlet (22mm)
   E - CH return (22mm)
2. Check the gas type specified on the identification plate matches that of the gas supply.

▶ Turn on the main gas supply, check the gas pipe work, connections and rectify any leaks.

3. Check the flue is correctly fitted and the connections are secure.
4. Check the condensate pipe work is correctly fitted and connected.

NOTICE: If the boiler is not to be commissioned immediately then, after successfully completing all of the checks and any rectification work:

- ▶ Close the gas valve
- ▶ Close the water shut off valve
- ▶ Isolate the gas supply
- ▶ Isolate the electricity supply
- ▶ Label appropriately

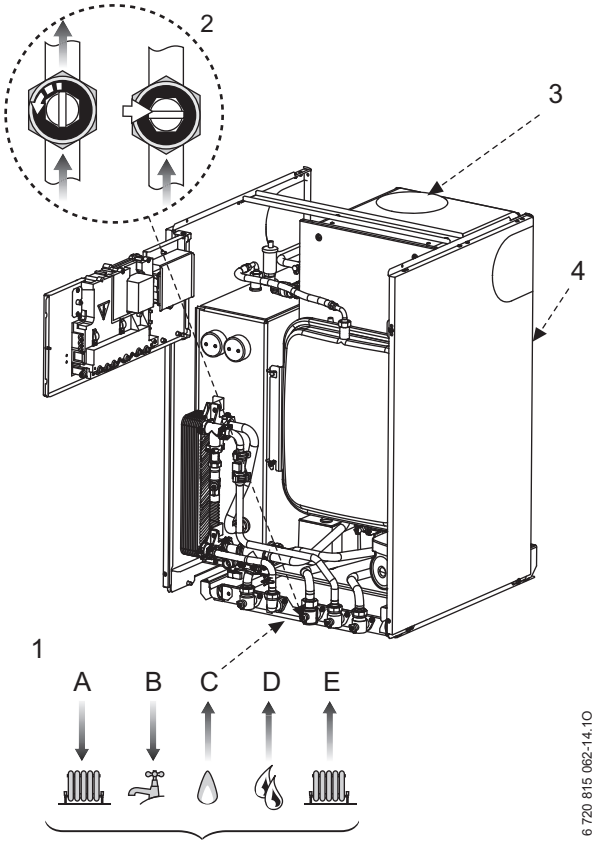


Fig. 49 Pre-commissioning checks

5.2 Filling the system

1. Pull the upper edges of the front panel forwards.
2. Lift front panel.

▶ Turn on the water main and open the system valves (align slot vertically).

▶ Open all radiator valves.

3. Unscrew the tank drain cap from the Tank drain valve.
4. Connect the integral filling loop from the Flow valve (A) using the hose (B) to the Tank drain valve (C).
5. Open the flow and tank drain valves.

▶ Fill the system to a pressure up to 1.5 bar.

▶ Close the flow valve.

▶ Close the tank drain valve.

▶ Disconnect the integral filling loop.

▶ Refit tank drain cap.

6. The Automatic Air Vent will release any air trapped in the boiler.
7. Vent all radiators, retighten the vent when completed.

▶ Check the system and correct any leaks.

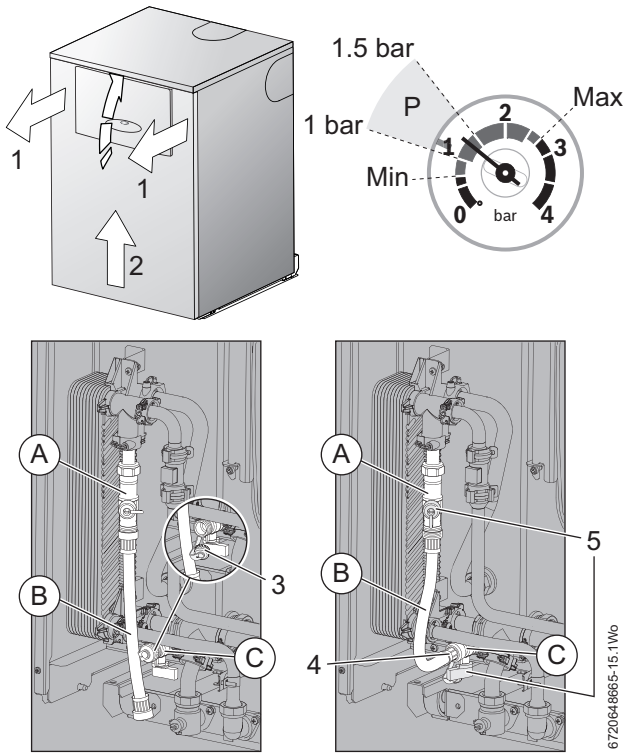


Fig. 50 Internal filling loop

▶ The boiler integral expansion vessel is pre-charged to 0.75bar (equal to a static head of 7.5m (22ft)). A Schraeder type valve is fitted to the expansion vessel to allow for pressure adjustment if required. If an extra expansion vessel is fitted to the central heating return, adjust this to the same pressure as the appliance internal expansion tank, refer to separate instructions with the extra expansion vessel.

5.3 Water treatment

NOTICE: Debris from the system can damage the boiler and reduce efficiency. Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance warranty.

NOTICE:
- ARTIFICIALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.

ENSURE THAT THE SYSTEM HAS BEEN CLEANED AS ON PAGE 10 OF THESE INSTRUCTIONS.

FLUSHING (Central Heating):
- Switch off the boiler.
- Open all radiator valves/drain cocks and drain the system while the appliance is hot.
- Close drain cocks.
- Add a suitable flushing agent and refill the system at the correct strength for the system condition in accordance with the manufacturer's instructions.
- Run the boiler/system at normal operating temperature for the time stated by the flushing agent manufacturer.
- Drain and thoroughly flush the system to remove the flushing agent and debris.

INHIBITOR (Central Heating):
- Check drain cocks are closed and all radiator valves are open before adding a suitable inhibitor compatible with aluminium (or combined inhibitor/anti-freeze if the system is exposed to freezing conditions) to the heating system water in accordance with the manufacturers instructions.

The pH value of the system water must be less than 8 or the appliance warrantee will be invalidated.

- Fill the system to between 1 and 1.5 bar via the supplied internal WRAS approved filling loop figure 50, page 32.
- Vent the boiler and all radiators; retighten vents when complete.
- Record the date when the inhibitor was added to the system on the guarantee card.

NOTICE:
- The concentration of inhibitor in the system should be checked every 12 months or sooner if system content is lost.
- The addition of sealing agents to the system water is not recommended as this can cause problems with deposits left in the heat exchanger.
- In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

5.4 Starting the appliance

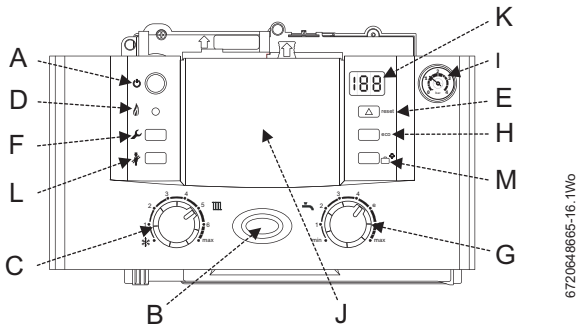


Fig. 51 Fascia guide

[A] Master switch for ON/OFF
[B] Mains ON/OFF indicator + fault diagnostic light
[C] Central heating temperature control
[D] Burner on indicator light (green)
[E] Fault reset button
[F] Service button
[G] Domestic hot water temperature control
[H] ECO button (domestic hot water pre-heat ON/OFF)
[I] System pressure gauge
[J] Position for optional programmer
[K] Display
[L] Central heating boost button
[M] Not used

Switching the appliance on/off:

NOTICE: Never run the appliance when the appliance or system is empty or unpressurised.

1. Turn on mains power supply.

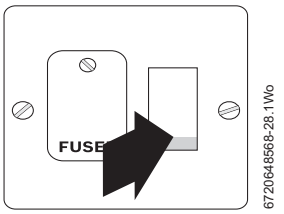


Fig. 52 Fused double pole isolator

- Turn on any external controls.
- Set the TRV controls to maximum.
- Set the clock/programmer to continuously ON and the room thermostat to maximum temperature.

2. Press button (A) and the power on indicator (B) illuminates blue.

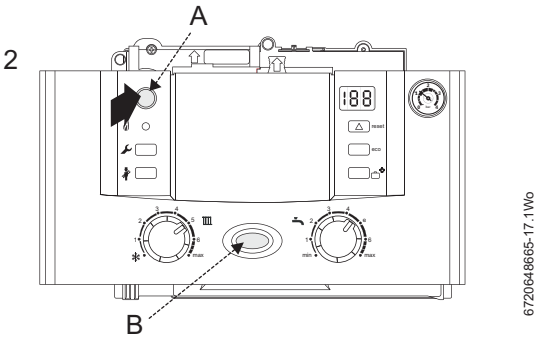


Fig. 53 Turning on the appliance

3. Turn the temperature control (C) to maximum. The burner on indicator (D) illuminates green when the burner has lit.

The boiler runs for 15 minutes at minimum heating output to fill the condensate trap. This occurs every time the mains supply has been interrupted.

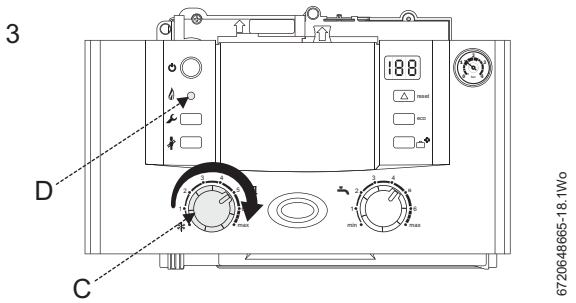


Fig. 54 Operating the boiler

4. If the boiler fails to light, the blue power indicator (B) and reset button (E) will flash alternately.

▶ To reset the boiler, press and hold the reset button (E) for 2 seconds.

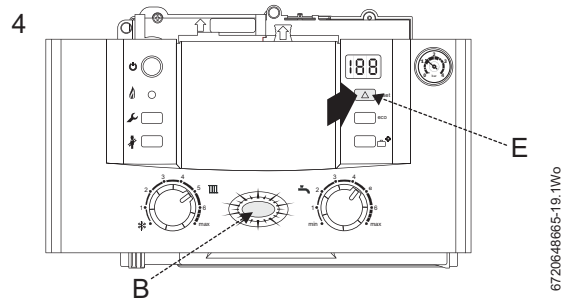


Fig. 55 Boiler reset

CAUTION: DO NOT PRESS THE POWER INDICATOR (B) TO RESET THE BOILER.

5.5 Checking gas inlet pressure

5.5.1 Measuring the inlet pressure

The inlet pressure to the appliance must be checked using the following procedure:

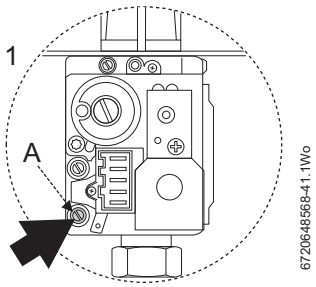


Fig. 56 Inlet test point

▶ Close gas isolation valve.
▶ Slacken the screw in the inlet pressure test point and connect a manometer.
▶ Open gas isolation valve.
▶ Measure the pressure with the boiler running at maximum.
  – Press Central heating boost button (L) for more than ten seconds and set Central Heating temperature to maximum.
  – The Central heating boost button (L) will illuminate continually and the blue power indicator will pulse five times.
▶ Check the gas supply working pressure at the gas valve conforms to values shown in figure or figure.

Ensure inlet pressure is satisfactory with all other gas appliances working.

Gas pressure within the system

The boiler must be running at maximum output rate when performing the gas rate check.

Refer to the figures below for natural gas or L.P.G gas pressures.

The pressure at the boiler must not be less than the pressure read at the meter minus:

- 1 mbar for Natural Gas
- 2.5 mbar for L.P.G.

The pressure drop from the meter to the gas valve must not be more than:

- 2.5 mbar for Natural Gas
- 4 mbar for L.P.G.

If the pressure drops are greater than shown below, then this would indicate a problem with the pipe work or connections within the system.

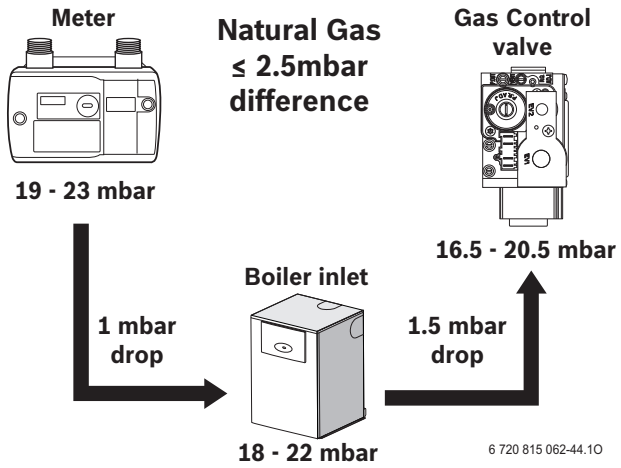


Fig. 57 Natural gas pressures

[≤] Equal to or less than

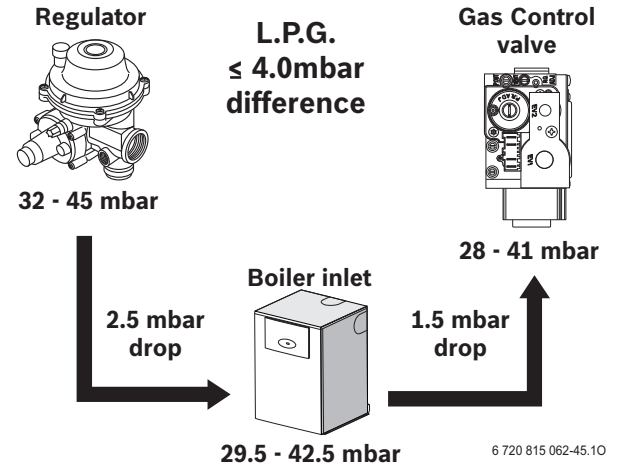


Fig. 58 L.P.G. pressures

NOTICE:
Do not continue commissioning until the correct gas pressure is achieved.

- If pressure is satisfactory press the Central heating boost button (L) again and the boiler will return to normal operation.
- If left in the central heating boost mode the control will return to normal operation after 15 minutes.
- Re-seal the screw in the gas inlet pressure test point.

5.5.2 Checking the gas rate

- The gas rate should be measured at the gas meter after 10 minutes operation at maximum, →refer to technical data in section 2.2.
- Where a gas meter is not available (e.g. L.P.G.) the CO/CO_2 must be checked to the units shown in the setting the air/gas ratio, → refer to section 6.6.
- If pressure and gas rate are satisfactory press the service button again and the boiler will return to normal operation.
  - If left in the service mode the control will return to normal operation after 15 minutes.
- Close the gas isolation valve.
- Remove the manometer.
- Re-seal the screw in the gas inlet pressure test point.
- Open the gas isolation valve.
- Ensure that there are no gas leaks.
- Replace the outer case.

5.6 CO and combustion check

The following combustion and flue integrity checks will be mandatory from April 2014 and these values must be recorded on the Benchmark check list, at the back of this manual.

Once the gas rate and pressure have been confirmed as acceptable then the CO and combustion checks can be undertaken.

The flow chart is given for guidance, the details of the checks are given in the following sections:

• Checking flue integrity

• Flue gas analysis, refer to section 6.5, page 37

NOTICE: Before CO and combustion checks:

- Refer to section 5.5.1 and 5.5.2 to verify gas type, gas inlet pressure, and gas rate. Visually check the integrity of the whole flue system and confirm that all the components are correctly assembled, fixed and supported.
- The flue gas analyser must be the correct type as specified in BS 7967. Before use the analyser must have been calibrated as specified by the manufacturer. The installer must be competent in the use of the analyser.
  Check and zero the analyser in fresh air as specified by the manufacturer.
- The air/gas ratio valve is factory set and must not be adjusted during commissioning unless this action is recommended following contact with the Worcester, Bosch Group help line 0330 123 3366.

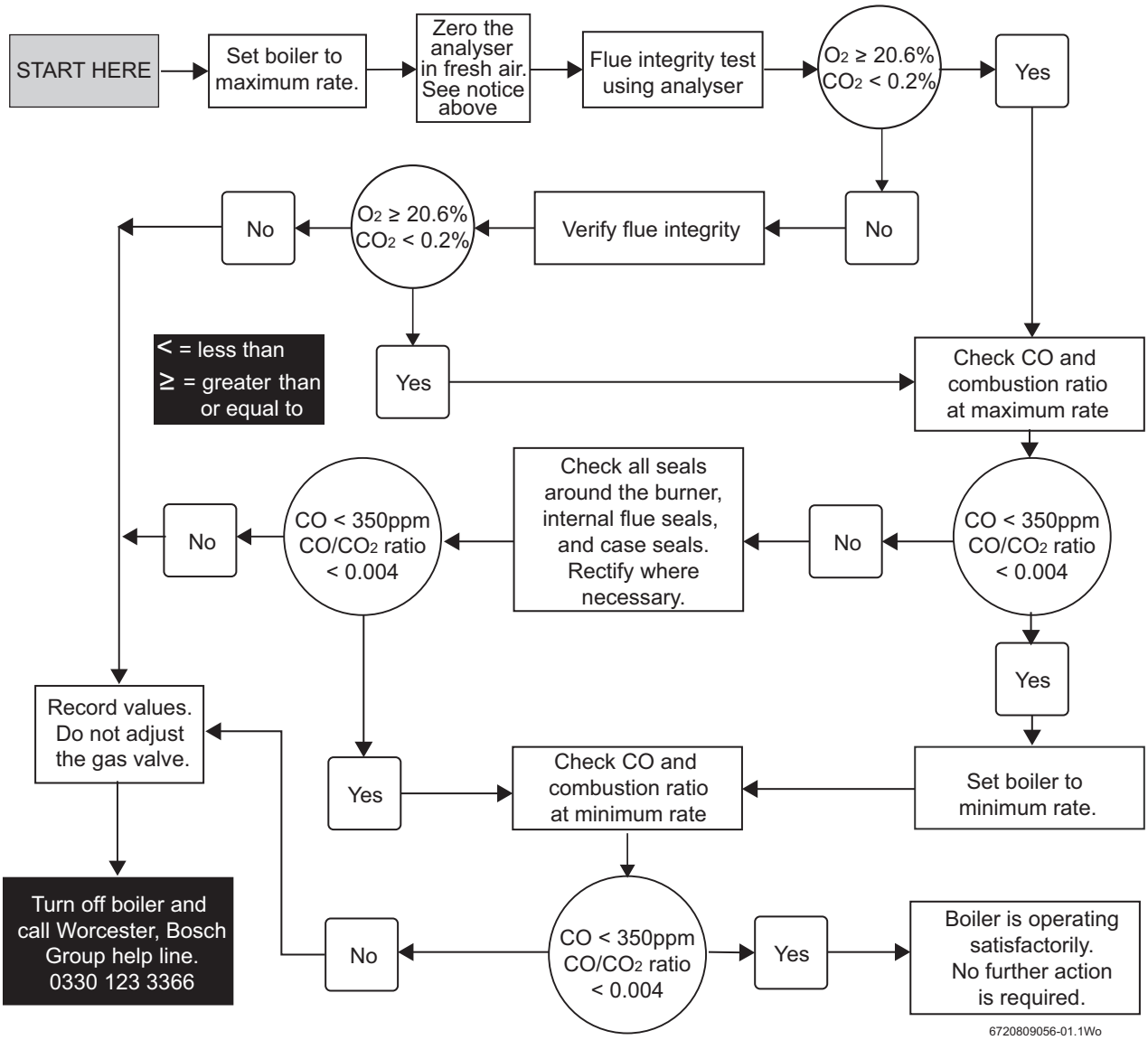

START HERE
Set boiler to maximum rate.
Zero the analyser in fresh air. See notice above
Flue integrity test using analyser
O2 ≥ 20.6% CO2 < 0.2%
Yes
No
Verify flue integrity
O2 ≥ 20.6% CO2 < 0.2%
No
< = less than
≥ = greater than or equal to
Yes
Check CO and combustion ratio at maximum rate
CO < 350ppm CO/CO2 ratio < 0.004
No
Check all seals around the burner, internal flue seals, and case seals. Rectify where necessary.
No
CO < 350ppm CO/CO2 ratio < 0.004
Yes
Record values. Do not adjust the gas valve.
Yes
Check CO and combustion ratio at minimum rate
Set boiler to minimum rate.
Turn off boiler and call Worcester, Bosch Group help line. 0330 123 3366
No
CO < 350ppm CO/CO2 ratio < 0.004
Yes
Boiler is operating satisfactorily. No further action is required.
6720809056-01.1Wo

Fig. 59 Commissioning checks

5.7 Finishing commissioning

At the time of commissioning, complete all relevant sections of the Benchmark Checklist located on the inside back pages of this document.

1. Engage top panel (A) onto rear retainers (B) and lower front of panel into position.
▶ Secure with screws (C).
2. Swing control panel assembly (D) into the boiler.
▶ Secure with screw (E).
3. Locate bottom corners of the front panel (F) into retainers (G).
▶ Push top of door to engage clips.

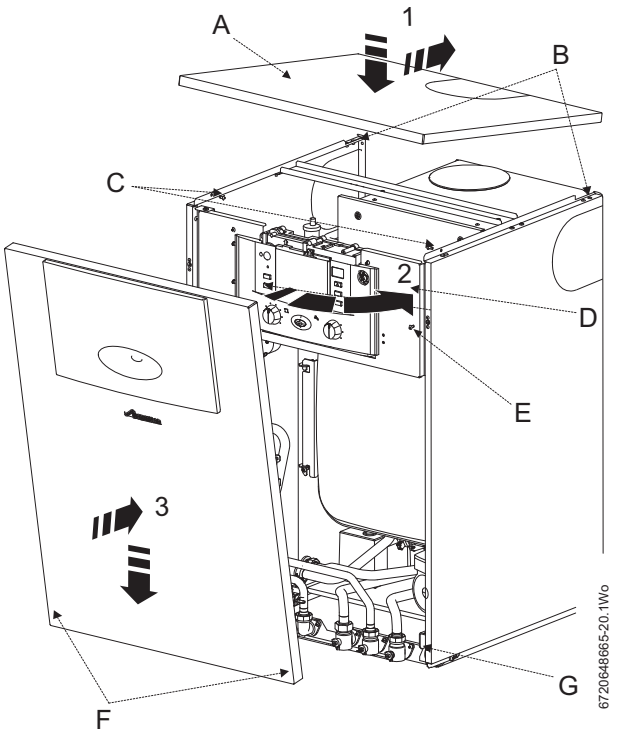


Fig. 60 Finishing commissioning

HANDOVER:

▶ Complete the Benchmark log book at the rear of the manual.
▶ Set up the controls and show the user how to operate all the controls shown in the User Guide.
▶ Instruct the customer how to repressurise the system.
▶ If the appliance is unused and exposed to freezing conditions, advise the customer of the precautions necessary to prevent damage to the boiler, system and building.
In the event of the appliance being inoperative, isolate the boiler and drain the system and boiler.

6 SERVICING and SPARES

6.1 Inspection and service

CAUTION: TURN OFF THE GAS SUPPLY AND ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.

NOTICE: COMPONENTS.
▶ After replacement of any components always check for gas tightness where relevant and carry out functional checks as described in Commissioning. Damaged O-rings or gaskets must be replaced.

NOTICE: Service work must be carried out by a competent registered engineer, such as British Gas or Gas Safe registered personnel!

NOTICE: SERVICE MUST **NOT** BE ATTEMPTED IF A CO/CO_2 ANALYSER IS **NOT** AVAILABLE.

▶ After servicing, complete the relevant Service Interval Record section of he Benchmark Checklist located on the inside back pages of this document.

- To ensure the continued efficient operation of the appliance it must be checked at regular intervals.
- The frequency of servicing will depend upon the particular installation conditions and usage however, an annual service is recommended.
- The extent of the service required by the appliance is determined by the operating condition of the appliance when tested by fully qualified engineers.

Inspection

1. Check that the terminal and the terminal guard, if fitted, are clear and undamaged.
2. If the appliance is in a compartment or cupboard check that the specified service space around the appliance is clear.
3. Check all the joints and connections in the system and remake any that show signs of leakage. Refill and re-pressurise if applicable as described in Commissioning.
4. Operate the appliance and take note of any irregularities. Call up the last fault stored by the Bosch Heatronic, Service Function ‘6A’. Refer to Fault Finding on page for rectification procedures.

Max pressure

▶ When the heating system water is at maximum temperature, 2.5 bar must not be exceeded. If this pressure is exceeded then an extra expansion vessel must be fitted into the system return as close as possible to the appliance.
▶ If the system does not retain the pressure, the expansion vessel and the heating system should be checked for leaks.

6.2 Service function

Setting boiler to maximum:

- When running in the heating boost mode, the boiler will operate both the Central Heating and DHW circuits. This is to allow sufficient time for setting procedure.
- It will be necessary to run water through the DHW circuit to ensure that the boiler will not cycle on low heating demands.

- Press and HOLD central heating boost button (L) for 10 seconds and set Central Heating temperature to maximum.
  The central heating boost button will illuminate continually.
  The boiler will stay in this mode for 15 minutes unless the central heating boost button is pressed again.

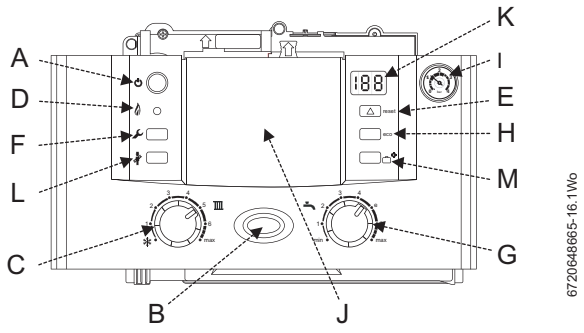


Fig. 61 Fascia guide

[A] MASTER SWITCH FOR ON/OFF
[B] MAINS ON/OFF INDICATOR + FAULT DIAGNOSTIC LIGHT (BLUE)
[C] CENTRAL HEATING TEMPERATURE CONTROL
[D] BURNER ON INDICATOR LIGHT (GREEN)
[E] FAULT RESET BUTTON
[F] SERVICE BUTTON
[G] DOMESTIC HOT WATER TEMPERATURE CONTROL
[H] ECO BUTTON (DOMESTIC HOT WATER PRE-HEAT ON/OFF)
[I] SYSTEM PRESSURE GAUGE
[J] POSITION FOR OPTIONAL PROGRAMMER
[K] DISPLAY
[L] BOOST BUTTON (SERVICE ONLY)
[M] NOT USED

6.3 Service inspection

1. Grip the outer sides of the front panel (A) pull and lift away from retaining lugs (B).
2. Remove retaining screw (C) to swing control panel assembly (D) outwards to its full extent.
3. Pull clip (E) outwards to release expansion vessel (F).
4. Swing expansion vessel (F) outwards.

For easier access to the inner case, the expansion vessel can be unhooked (by removing the retaining screw on the hinge) lowered and moved to the side. Take care not to overstretch the flexible pipe connections.

5. Release four screws (G) to remove the inner case cover (H).

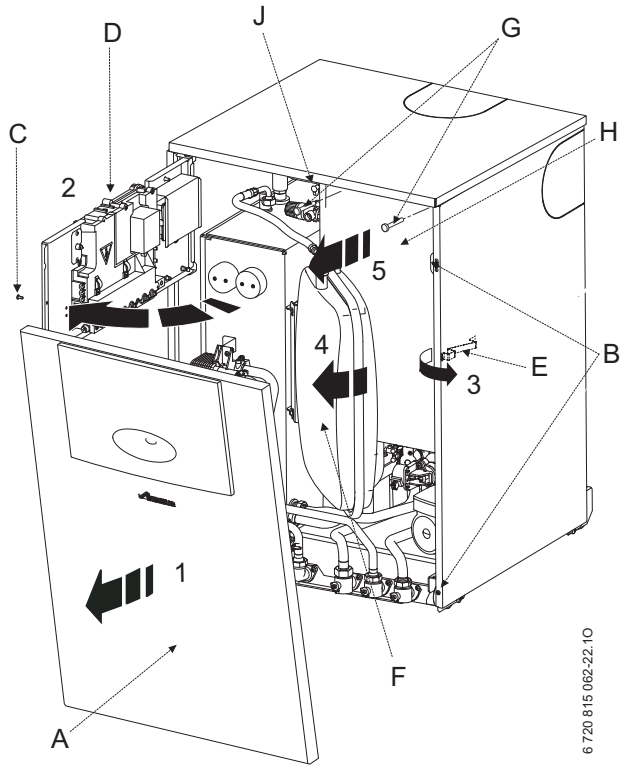


Fig. 62 Access for servicing

6.4 Fan pressure test

- Connect a manometer to the fan pressure test point, (1).
- Set the boiler to maximum output.
- After measurement replace test point cover.

Pressure readings will be negative, refer to chart below.

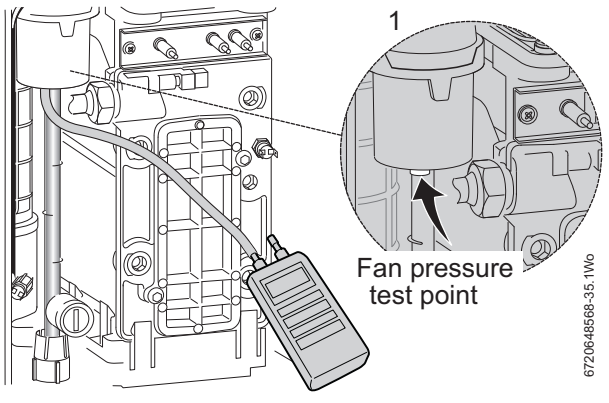


Fig. 63 Fan control pressure test

NOTICE: Fan pressure test
- The boiler must be run at maximum output for the fan pressure test.

With the combustion air intake pipe fitted and the boiler running at maximum output, measure the fan pressure:

- The pressure will read negative, refer to the chart in figure 64 below.

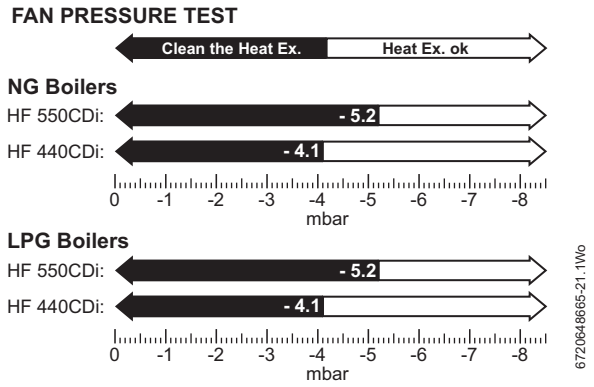


Fig. 64 Fan control pressure readings

- If the manometer reading is in the white area of the chart the heat exchanger/exhaust path/siphon does not require attention.
- If the manometer reading is in the black area of the chart then carry out the following checks:
  - Check that the siphon is not blocked.
  - Check the exhaust paths for restrictions.
  - Clean the heat exchanger with a suitable cleaning tool, refer to section 6.7 - Cleaning the heat exchanger.
- Re-check the fan pressure readings.

If the boiler, after completing the above checks, fails the fan pressure test then contact Worcester, Bosch Group for advice.

- After the measurements are taken switch the boiler off.
- Remove the combustion air intake pipe.
- Disconnect the manometer and replace the test point cover.
- Replace the combustion air intake pipe.

6.5 Flue gas analysis

Ensure that the gas inlet pressure is correct before continuing, refer to section 5.5.1

Combustion test:

- Remove cap on the “flue gas sample point”, as shown below and connect a flue gas combustion analyser. Replace the cap after use.
- Run the boiler at maximum output for at least 10 minutes.
- Check the CO/CO_2 readings against the information in table 23 CO/CO_2 settings on page 40.

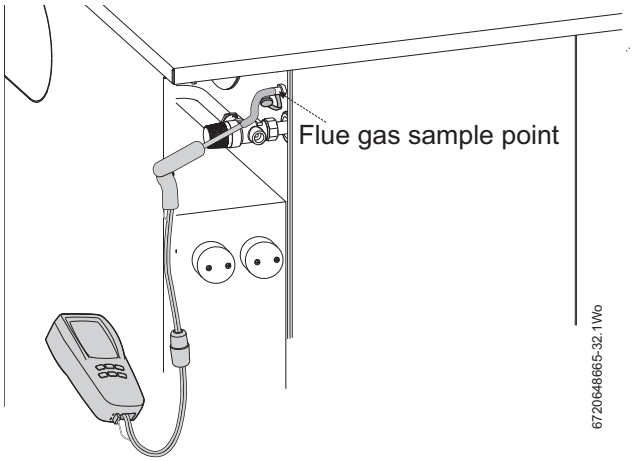


Fig. 65 Flue integrity test

If the boiler fails the combustion test, check:

1. Air intake for restriction
2. Diaphragm in the fan, for correct operation
3. Cleanliness of the heat cell, plus blockages in the condensate disposal.

6.6 Setting the air/gas ratio

NOTICE: THE SETTING OF THE GAS RATIO MUST BE CARRIED OUT BY A COMPETENT PERSON. SETTING OF THE GAS RATIO MUST NOT BE ATTEMPTED UNLESS THE PERSON CARRYING OUT THE TEST IS EQUIPPED WITH A COMBUSTION ANALYSER CONFORMING TO BS 7927 AND IS COMPETENT IN ITS USE.

- Refer to section 5.5.1 and ensure that the gas inlet pressure is correct before continuing.
- To adjust the CO/CO_2 it will be necessary to first operate the boiler at maximum output.
- Press and hold down the boost button (B) for 10 seconds.
- Turn temperature control (C) to maximum, the boiler will then go to maximum output.

The control will resume normal operation after 15 minutes or if the boost button (B) is pressed for more than 1 second.

- Remove plastic cap and using a flat bladed screwdriver, set the CO_2 via adjuster (D) referring the table 23.
- Check the CO is less than 200ppm.

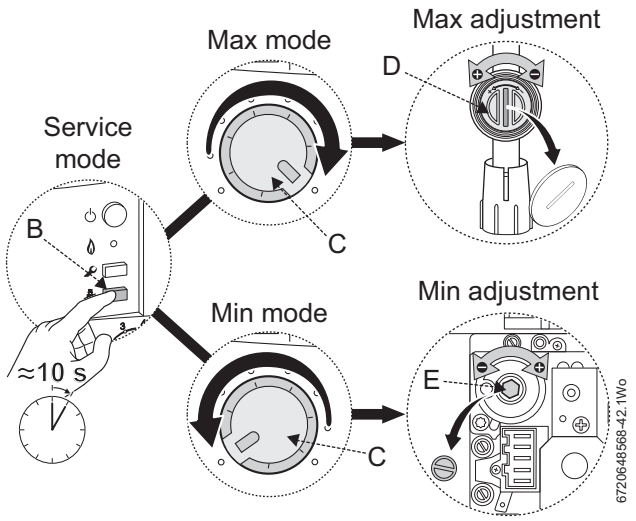


Fig. 66 Setting air/gas ratio

- Turn the temperature control (C) to minimum. This will make the boiler go to minimum output.
- Measure the CO_2 it should now be at the figure for minimum output shown on the table 23. If not, remove cap and adjust (E) on the gas valve until correct.
- Check the CO is less than 200ppm.
- Turn temperature control to maximum output and recheck the CO_2. If correct, hold down the boost button (B) for two seconds, the boiler should return to normal operating mode with the blue power indicator permanently illuminated.
- Remove manometer and re-seal the inlet pressure point on the gas valve.
- Fit a new plastic sealing cover to outlet adjuster (D) and replace the cap on the gas valve.

GAS TYPE	CO_2 setting max.	CO_2 setting min.
Greenstar HF 440CDi ErP		
Natural Gas	9.4 ±0.5%	8.6 ±0.5%
LPG (propane)	10.8 ±0.5%	10.4 ±0.5%
Greenstar HF 550CDi ErP		
Natural Gas	9.4 ±0.5%	9.0 ±0.5%
LPG (propane)	10.8 ±0.5%	10.4 ±0.5%

Table 23 CO/CO_2 settings

6.7 Cleaning heat exchanger

NOTICE: COMBUSTION TESTING
- Combustion testing must be carried out by a competent person. Testing must not be attempted unless the person carrying out the combustion check is equipped with a Combustion Analyser conforming to BS 7927 and is competent in its use.

NOTICE: CO/CO_2 CHECKS
- If the joint between the Air/Gas manifold and heat exchanger is disturbed the sealing gasket must be replaced.
- After completing the service of the appliance, the CO/CO_2 must be checked and set to the limits shown in “Setting the air/gas ratio” on page 40.

WARNING: Cleaning access cover
- Do not remove the cover unless a new gasket is available for re-assembly.

If the heat exchanger requires cleaning

An accessory kit is available (No. 840) specifically designed for cleaning the heat exchanger. If required order 7 719 001 996.

2. Remove the cleaning access cover (B), seal (C) and metal plate (D) securing it, if present.

3. Unscrew the condensation trap cap and place a suitable container underneath.

Use a new seal when reassembling.

4. Loosen any deposits in the heat exchanger from top to bottom using the cleaning blade.

- Clean the heat exchanger from top to bottom using the brush.
- Refit the “clean out” access cover in reverse order using a new seal (C), hand tighten screws and then use a spanner to tighten a further half turn.
- After re-assembly check that the CO/CO_2 levels are as described in the section “Setting the air/gas ratio”.

To remove the condensate pump

- ▶ Disengage the condensate pipe from the condensate pump.
- ▶ Remove the condensate pump from the base panel.
- ▶ After servicing the heat exchanger, fill the condensate trap with approximately 250 millilitres of water and refit in reverse order.

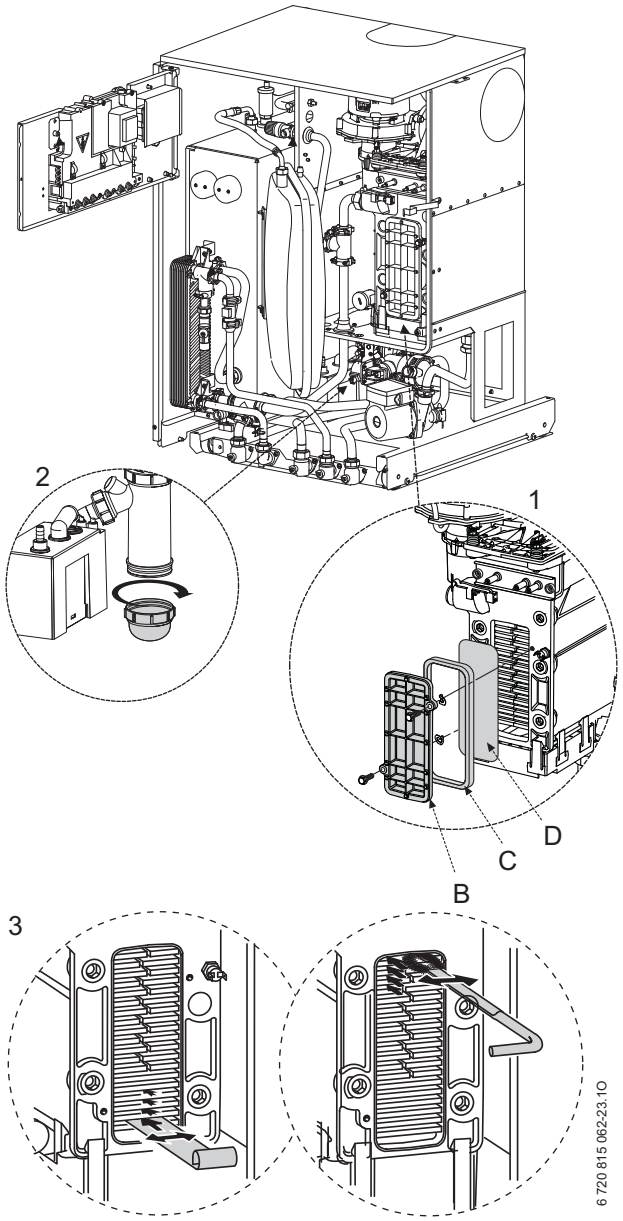


Fig. 67 Cleaning heat exchanger

To clean the burner

WARNING: Burner
- ▶ Do not remove the burner unless a new gasket is available for re-assembly.

- ▶ Check that the boiler is completely isolated from the gas supply.

1. Remove the clips (A), castellated nuts(B1) and springs (B2) from the studs (B).

- ▶ Unscrew and remove the two hexagon headed screws (C) securing the fan. Remove nut (D1) from the rear stud (D). Remove the burner cover plate (E).

2. Remove the burner (F) and clean the components.
Do not use a wire brush.

Re-assembly of the burner cover

NOTICE: Burner gasket seal
- ▶ Always replace the burner seal with a new one when the joint has been disturbed.

- ▶ Re-assemble the burner in reverse order using a new seal (G).
- ▶ Insert the burner cover under the rear securing bolt and tighten down.
- ▶ Assemble the washers/ spring [B2], and castellated nut [B1]on to the studs [B] to secure the burner cover to the heat exchanger.
- ▶ Using a 10mm spanner, tighten the castellated nuts [B] until the burner cover bottoms out on the heat exchanger.
- ▶ The nuts will stop turning at this point, do not overtighten.
- ▶ If necessary, back the nuts off slightly until the hole for the clip [A] is visible. Insert the clips [A] and secure.
- ▶ After re-assembly check that the CO/CO_2 levels are as described in the section “Setting the air/gas ratio”.

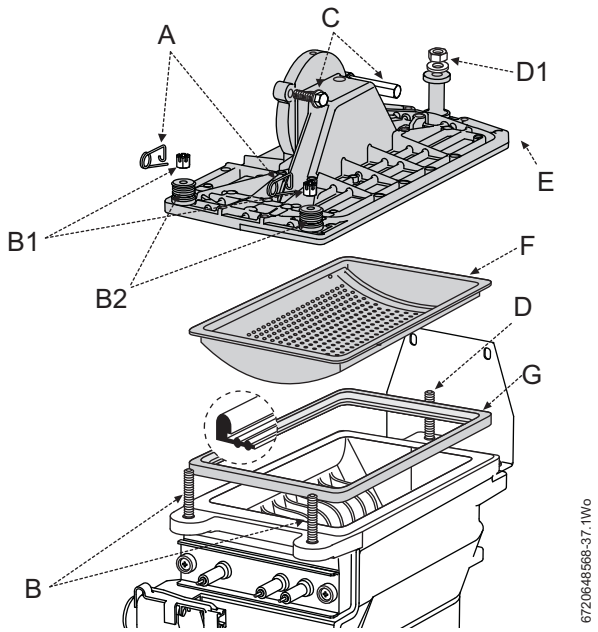


Fig. 68 Burner removal

Electrical wiring

- ▶ Check the electrical wiring for physical damage and replace any damaged wires.

To check the flap valve in the fan intake

- ▶ Refer to page 43 for access to the fan intake.
- ▶ Carefully withdraw the flap valve from fan intake tube and check for soiling and splits, clean or replace as required.
- ▶ Take care when refitting the flap valve, the flaps must open upwards into the fan in take tube.
- ▶ After re-assembly check CO/CO2 levels as described in the section “Setting the air/gas ratio”.

To clean the condensate trap

- ▶ Remove condensate pump refer to page 41.
- ▶ Remove screw retaining trap (1).
- ▶ Swing retainer (2) to release the condensate trap.
- ▶ Remove trap (3) from boiler.

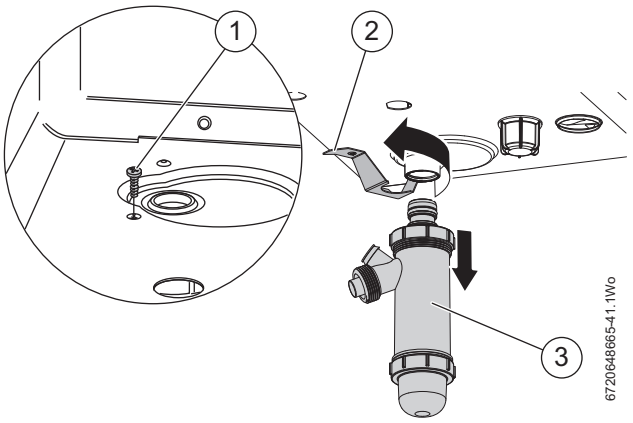


Fig. 69 Condensate trap access

6.8 Replacement parts

CAUTION:

- ▶ TURN OFF THE GAS SUPPLY AND ISOLATE THE MAINS ELECTRICAL SUPPLY BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS.
- ▶ DRAIN THE BOILER/SYSTEM WHERE NECESSARY AND PROTECT ANY ELECTRICS FROM WATER INGRESS DURING COMPONENT REPLACEMENT.

NOTICE:

- ▶ Refit or replace any components removed from the appliance in the reverse order using new gaskets/'O' rings/sealant/heat transfer paste where necessary.
- ▶ Any 'O' ring or gasket that appears damaged must be replaced. Always check that any electrical connections are correctly made and that all screws are tight.

AFTER REPLACEMENT OF ANY COMPONENTS ALWAYS CHECK FOR GAS TIGHTNESS WHERE RELEVANT AND CARRY OUT FUNCTIONAL CHECKS AS DESCRIBED IN THE COMMISSIONING SECTION.

NOTICE:

- ▶ Any service work must be carried out by competent registered engineers, such as British Gas or other GAS SAFE registered personnel.
- ▶ After re-assembly the combustion must be checked using the procedure in the section “Setting the air/ gas ratio”. Measurement and setting of the gas ratio must not be attempted unless the person is equipped with a combustion analyser conforming to BS 7927 and is competent in its use.

DRAINING THE APPLIANCE:

- ▶ Turn off the system heating flow and return isolation valves - external to boiler.

1. Unscrew the tank drain cap from the drain tank valve (A).
2. Connect the hose connection and nut (supplied with boiler, literature pack).
3. Using a suitable hose, attach one end to the drain tap on the boiler return elbow and lead the other end of the hose to an external drain point.
4. Fully open the drain tap (B) on the drain tank valve (A).

- ▶ Close the drain tap when the flow from the appliance has stopped and remove the hose.

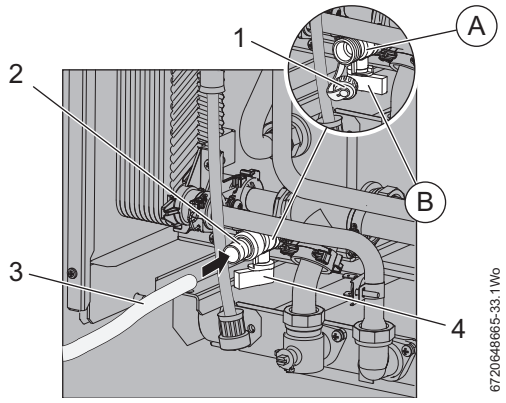


Fig. 70 Draining the boiler

A small quantity of water may remain in some components even after the appliance has been drained. Protect any electrical components when removing items from the water circuits.

PCB CONTROL BOARD:

Access to boiler control components

- ▶ Remove the screws (A) to release the cover from the controller.

PCB Fuse

- ▶ Remove the fuse (B) and replace with a spare that are clipped on the inside of the controller cover.

PCB

- ▶ Disconnect all electrical connections from the control.
- ▶ Remove the screws (C) retaining the rear panel of the control and remove the panel.
- ▶ After re-assembly check CO/CO2 levels as described in the section “Setting the air/gas ratio”.

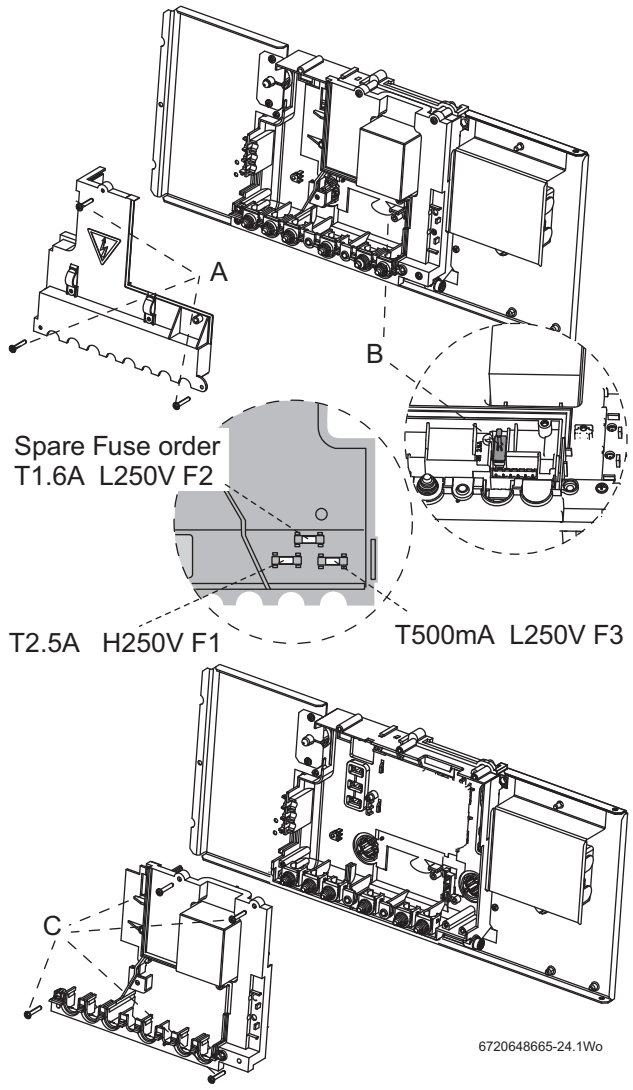


Fig. 71 PCB

Fan Assembly:

A SERVICE TO THE FAN ASSEMBLY AND FLAP VALVE MUST NOT BE ATTEMPTED IF A CO/CO2 ANALYSER IS NOT AVAILABLE.

- Undo the lower pipe union on gas pipe (E).
- Remove the fan lead and earth connector.
  The earth connector has a positive clip fixing.
- Remove the fixing screws attaching fan (A) to the burner cover (B).
- Remove the fan (A) with gas pipe (E) and mixer unit (D).
- Twist the mixer unit (D) with gas pipe (E) to separate from fan (A).
- After re-assembly check that the CO/CO_2 levels are as described in the section “Setting the air/gas ratio”.

Flap Valve:

- Undo the lower pipe union on gas pipe (E).
- Remove the pipe (E) by pushing upwards and to the rear.
- Twist the mixer unit (D) with gas pipe (E) to separate from fan (A).
- Remove the flap valve (F) from within fan intake (A) and replace.
- After re-assembly check that the CO/CO_2 levels are as described in the section “Setting the air/gas ratio”.

Ensure the flap valve is fitted correctly with rubber flap upwards.

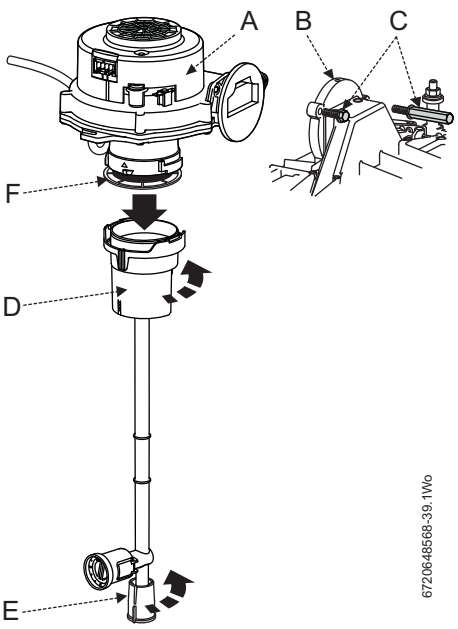


Fig. 72 Fan assembly

Condensate pump:

- Disconnect electrical connections in control box, see wiring schematic in the ‘Fault finding and Diagrams’ section.
- Remove 15mm flexible tube (H) from pump by rotating anti-clockwise and pulling up.
- Remove black flexible pipe (J) from condensate tank. Take care as there maybe condensate remaining in the pipe.
- Carefully remove the condensate pump (G) from the boiler and pour any excess condensate into a suitable container for safe disposal.

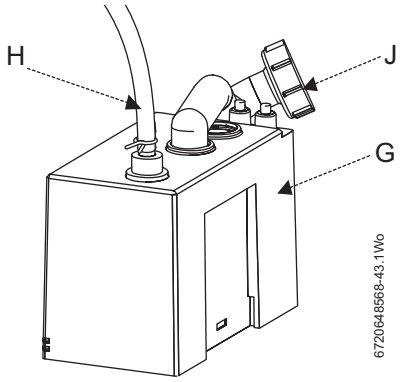


Fig. 73 Condensate pump

Diverter valve motor

- ▶ Ensure that the appliance is in service mode (there is no need to drain the appliance).
- ▶ Disconnect the electrical connector (K) from diverter valve motor (L).
- ▶ Pull the motor (L) to you, the assembly will slide free from the valve.
- ▶ To refit, follow the reverse of above.

In case of problems when refitting the motor: connect the electrical connector to the motor and switch the appliance on. When the motor goes into the middle position the motor can be fitted without difficulty.

Diverter valve

- ▶ Ensure that the appliance has been fully drained.
- ▶ Disconnect the electrical connector (K) from diverter valve motor (L).
- ▶ Undo the two screws holding the valve actuator body to the plastic housing (N).
- ▶ Remove the motor and valve actuator body from the diverter valve.
- ▶ Withdraw the valve actuator from the diverter valve.
- ▶ To refit assemble in reverse, ensuring that the valve actuator is properly seated on the two lugs of the actuator body.

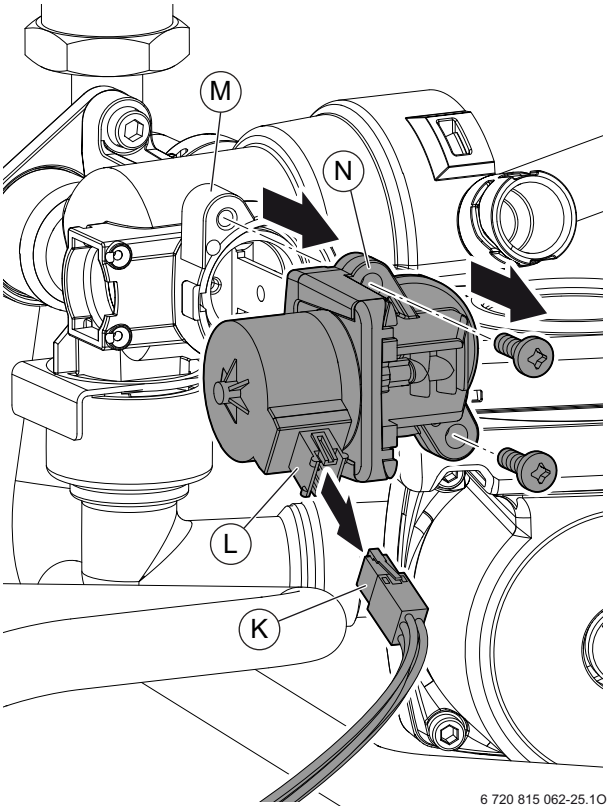


Fig. 74 Diverter valve

Sensors:

- ▶ Check that the appliance is electrically isolated.

Central heating flow temperature sensor (A):

- ▶ Remove the connector.
- ▶ Release the sensor clip and withdraw the sensor.
- ▶ Apply heat transfer paste to the replacement sensor.

Safety temperature limiter (B):

- ▶ Remove the connectors.
- ▶ Unscrew the sensor.

Tank sensor (C):

- ▶ Remove the screws retaining plastic cover.
- ▶ Remove the cover and disconnect the two electrical connections.
- ▶ Unscrew 2 hexagon studs.
- ▶ Replace the sensor, coating surface with paste supplied.
- ▶ Re-assemble.

Tank overheat thermostat (D):

- ▶ Remove the screws retaining plastic cover.
- ▶ Remove the cover and disconnect 2 electrical connections.
- ▶ Unscrew the two hexagon studs.
- ▶ Replace the sensor, coating surface with paste supplied.
- ▶ Re-assemble.

Flow sensor/flow regulator assembly (E):

- ▶ Shut off the mains water at inlet valve and drain DHW circuit.
- ▶ Disconnect the in-line connector.
- ▶ Remove the two retaining clips (F).
- ▶ Remove the flow sensor assembly (E).
- ▶ Remove the brass housing with flow regulator (G) from sensor.
- ▶ Re-assemble ensuring that retaining clips are correctly positioned.

Flue Temperature limiter (H)

- ▶ Remove the connector.
- ▶ Unscrew the sensor.

Domestic hot water temperature sensor (J):

- ▶ Release and pull-off the electrical connectors.
- ▶ Unscrew the bracket.
- ▶ Replace the sensor coating surface with paste supplied.
- ▶ Re-assemble.

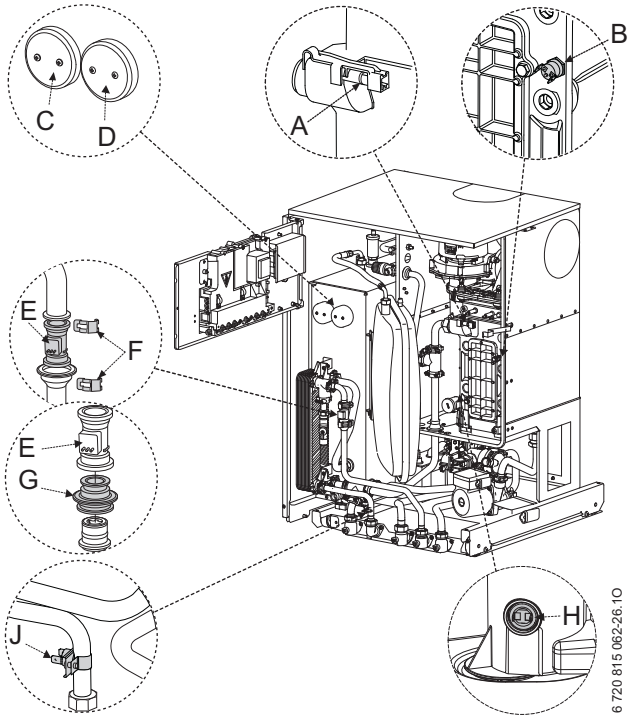


Fig. 75 Sensors

Domestic hot water heat exchanger:

- ▶ Before removing the heat exchanger, close the mains water inlet isolation valve and drain the hot water circuit. Close the CH isolating valves and drain the appliance.
  The pipe (A) may be removed between the flow sensor outlet and the plate heat exchanger to improve access to the rear connections.
- ▶ Undo the two screws securing the plastic housing to the heat exchanger.
- ▶ Remove the heat exchanger.
- ▶ To refit, follow the above in reverse. Ensure any seals that have been disturbed are replaced.

Pressure gauge:

- ▶ Drain the appliance.
- ▶ Unplug the connection to the pressure relief valve.
- ▶ Remove the two screws from rear of control panel and remove pressure gauge.
- ▶ Replace the O-ring and replace pressure gauge.

Expansion vessel:

- ▶ Drain the appliance.
- ▶ Move the control panel into service position.
- ▶ Remove the locking screw (C) from vessel bracket.
- ▶ Hinge the pressure vessel out and lift from brackets.
- ▶ Undo the union connection at the top of the vessel.
- ▶ Set the pressure of the new vessel to that required by the system.

Pressure relief valve:

- ▶ Drain the appliance.
- ▶ Disconnect the drain pipe from valve (D)
- ▶ Undo the nut retaining valve to flow pipe.
- ▶ Undo the nut connecting pressure gauge.
- ▶ Remove the valve.
- ▶ Replace the sealing washer and fit a new valve.

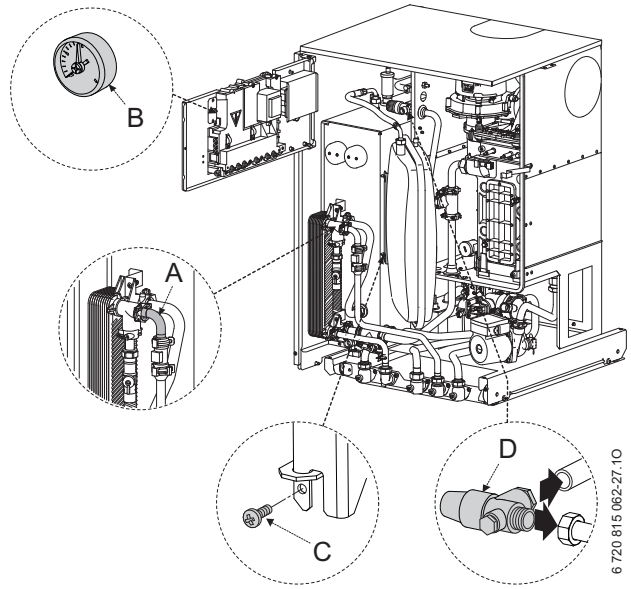


Fig. 76 Replacement parts

Condensate trap:

- ▶ Move the control panel and pressure vessel into service position.
- ▶ Remove the inner case door.
- ▶ Remove the condensate pump refer to page 43.
- ▶ Remove the screw retaining trap (1).
- ▶ Swing the retainer (2) to release the condensate trap.
- ▶ Remove the trap (3) from boiler.

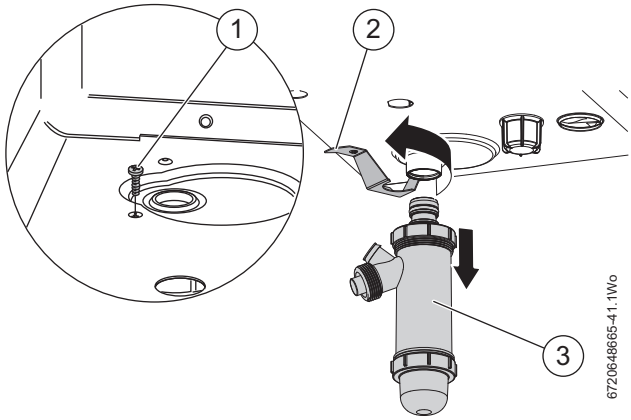


Fig. 77 Condensate trap access

Gas valve:

- ▶ Check that the gas cock is turned off.
- ▶ Remove the condensate pump.

1. Undo the union, within the inner casing, securing the valve to the gas/air tube.
2. Remove the black rubber tube from the gas valve (G).
3. Release the gas inlet union at the inlet.
4. Remove the solenoid connections at the side of the gas valve.

- ▶ Transfer the inlet pipe assembly to the new gas valve.
- ▶ Check for gas tightness when the new gas valve has been fitted.
- ▶ After re-assembly check CO/CO2 levels as described in the section “Setting the air/gas ratio”.

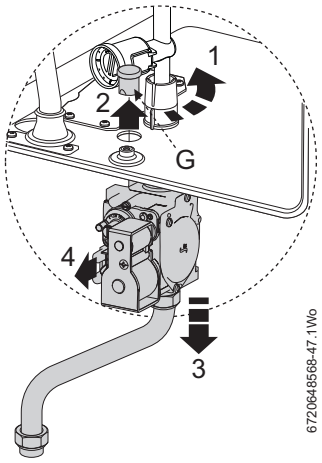


Fig. 78 Gas valve

Electrode assembly and heatshield:

- ▶ Switch off the master switch.
- ▶ Isolate the appliance from the power supply.
- ▶ Move the control panel into service position.
- ▶ Release the 4 screws to remove inner case door.
- ▶ Remove the leads from the electrodes.
- ▶ Unscrew the two fixing screws (B) and carefully remove the electrode assembly (A).
- ▶ Inspect the spark/flame electrode assembly and ceramics for signs of contamination or damage, replace as necessary.
- ▶ Replace the electrode set and gasket.
- ▶ Re-assemble with the new gasket and secure with the screws (B) removed earlier.
- ▶ After re-assembly check that the CO/CO_2 levels as described in the section “Setting the air/gas ratio”.

Burner:

WARNING: Burner
- Do not remove the burner unless a new gasket is available for re-assembly.

- Check that the gas cock is turned off and the master switch is in the OFF position.
- Isolate the appliance from the power supply.
- Remove the clips (C1), castellated nuts (C) and springs (C3) from the studs (C).
- Unscrew and remove the 2 hexagon screws (D) securing the fan.
- Remove nut and washer (E1) from the rear stud (E).
- Remove the burner cover plate (F).
- Remove the burner (G).
- Re-assemble the new burner in reverse order.
- Replace the burner seal (H) with a new one.
- Refer to the section “Re - assembly of the burner cover” on page 41.
- After re-assembly check that the CO/CO_2 levels as described in the section “Setting the air/gas ratio”

Primary heat exchanger:
- Isolate the appliance from the power supply.
- Turn off all the isolation valves.
- Drain down the appliance.
- Move the control and pressure vessel into service position.
- Remove the inner case door.
- Remove the fan assembly, burner, gas mixing tube.
- Disconnect and remove the sensors connected to heat exchanger.
- Remove the condensate trap.
- Remove the internal flue elbow and tube from boiler sump.
- Disconnect the return pipe union (J) at the base of the boiler heat exchanger.
- Remove the plastic nut (K) from the base of the inner casing.
- Remove the heat exchanger from inner casing.
- Ensure that heat conductive paste is used on sensors when refitting.
- Check the seals and replace if necessary.
- After re-assembly check that the CO/CO_2 levels as described in the section “Setting the air/gas ratio”.

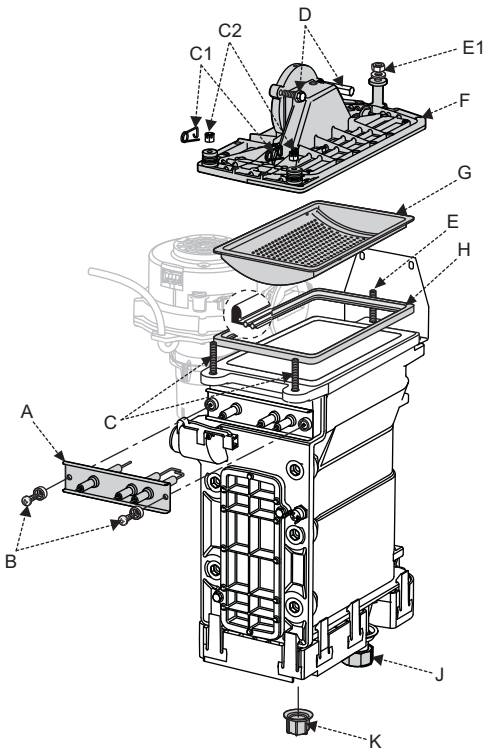


Fig. 79 Primary heat exchanger

6.9 Short parts list

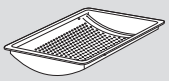
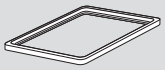
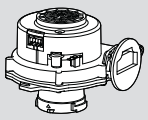
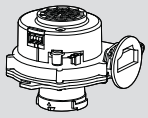
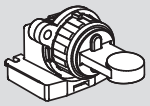
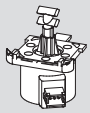
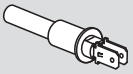
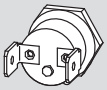
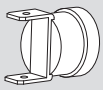
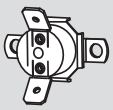
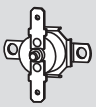
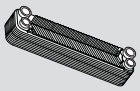
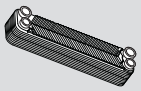
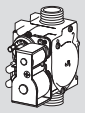
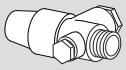
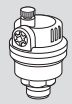
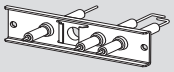
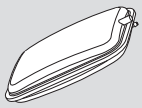
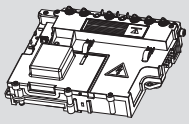
 Burner 8 718 006 658 0 GC No. E27 200	 Burner seal 8 711 004 168 0 GC No. E27 201	 Fan 440 CDi 8 717 204 373 0 GC No. E74-539
 Fan 550 CDi 8 716 116 067 0 GC No. N/A	Pump 8 716 117 455 GC No. J25 460	 Diverter valve assembly 8 716 106 845 0 GC No. H02 533
 Diverter valve motor 8 716 106 847 0 CG No. H02 534	Flow turbine 8 717 002 132 0 GC No. H21 232	Flow regulator 440 CDi 20 litre beige 8 717 002 135 0 GC No. H21 235
Flow regulator 550 CDi 25 litre light grey 8 718 681 198 0 GC No. H66 928	 Flow NTC 8 714 500 087 0 GC No. E74 536	 Limit NTC (flue/heat exchanger) 8 722 963 858 0 GC No. H08 291
 DHW NTC 8 716 142 302 0 GC No. 375 696	 Tank NTC 8 716 142 319 0 GC No. 379 785	 Tank OH NTC 8 716 103 217 0 GC No. E82 394
 Heat exchanger 440 CDi 8 716 108 212 0 GC No. H22 465	 Heat exchanger 550 CDi 8 718 680 648 0 GC No. H66 931	 Gas valve 8 718 221 347 0 GC No. H56 469
Condensate pump 8 716 114 077 0 GC No. H66 921	 Pressure relief valve 8 716 142 416 0 GC No. 386 789	Pressure gauge 8 718 680 742 0 GC No. H66 930
 Auto air vent 8 716 140 500 0 GC No. E00 717	 Set of electrodes including seal 8 718 664 301 0	 Expansion vessel 8 715 407 288 0 GC No. H21 242
 Control unit 8 737 703 196 0		

Table 24

7 FAULT FINDING and DIAGRAMS

7.1 Electrical wiring diagram

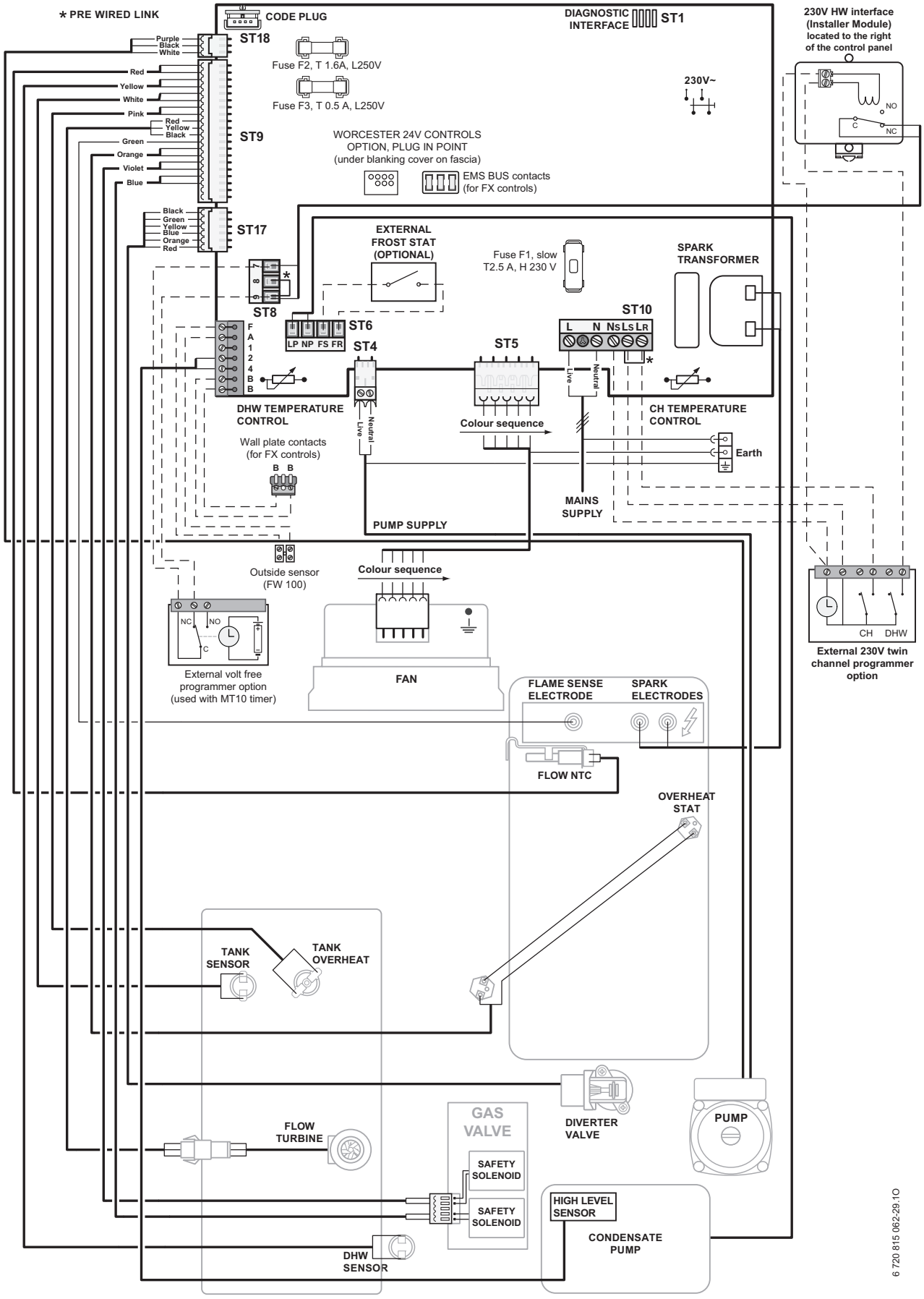
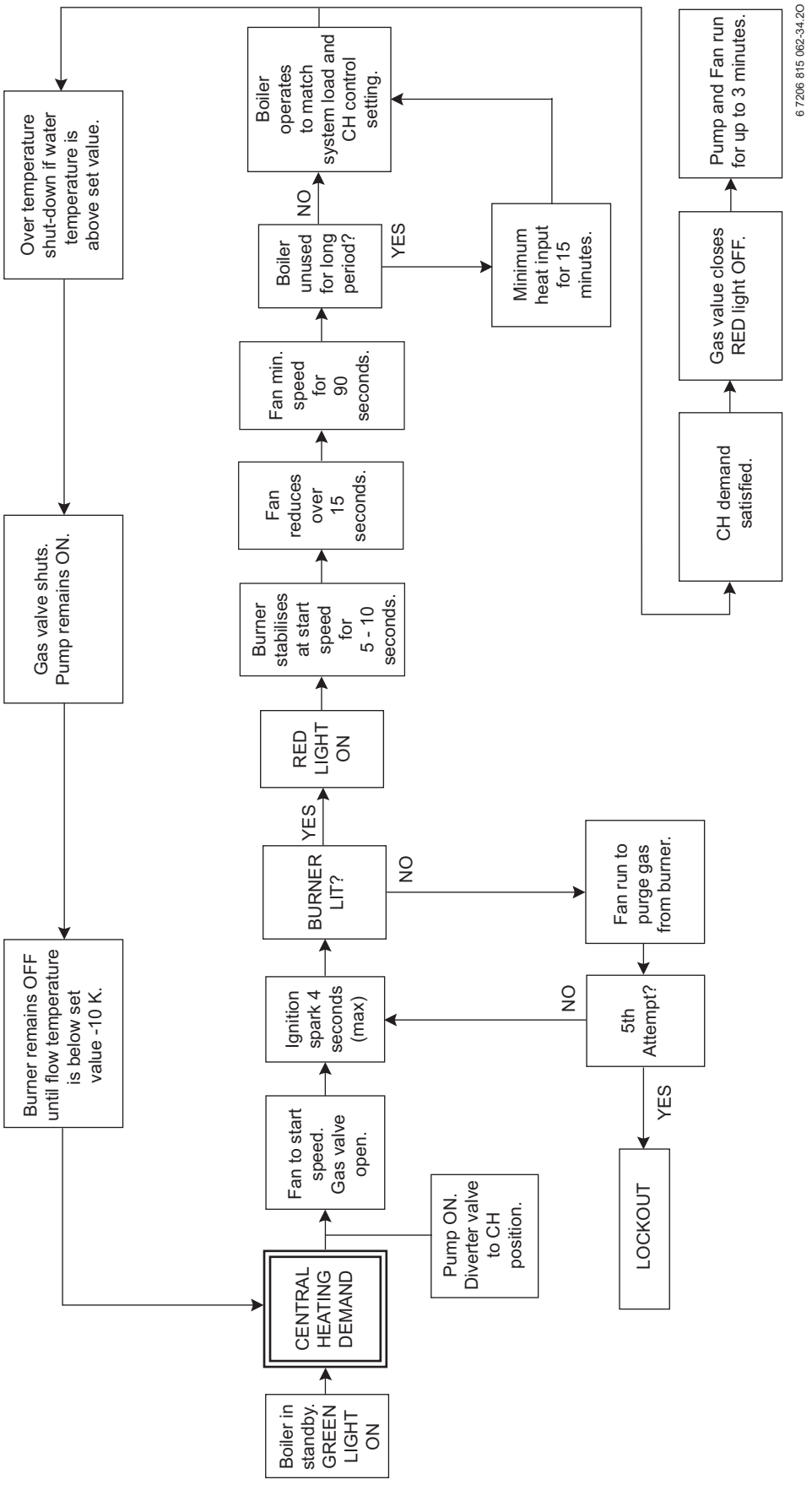
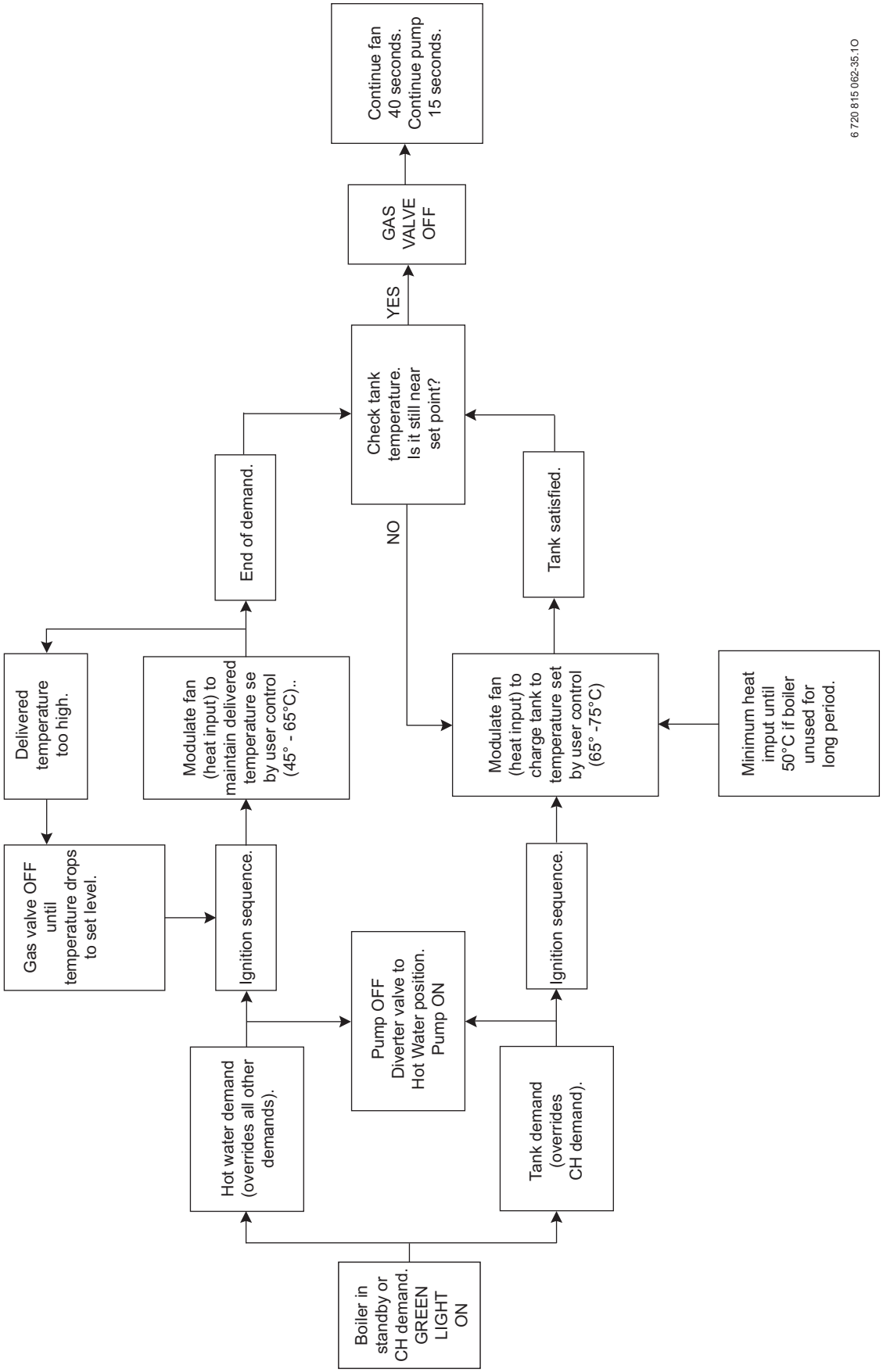


Fig. 80

7.2 Central heating function

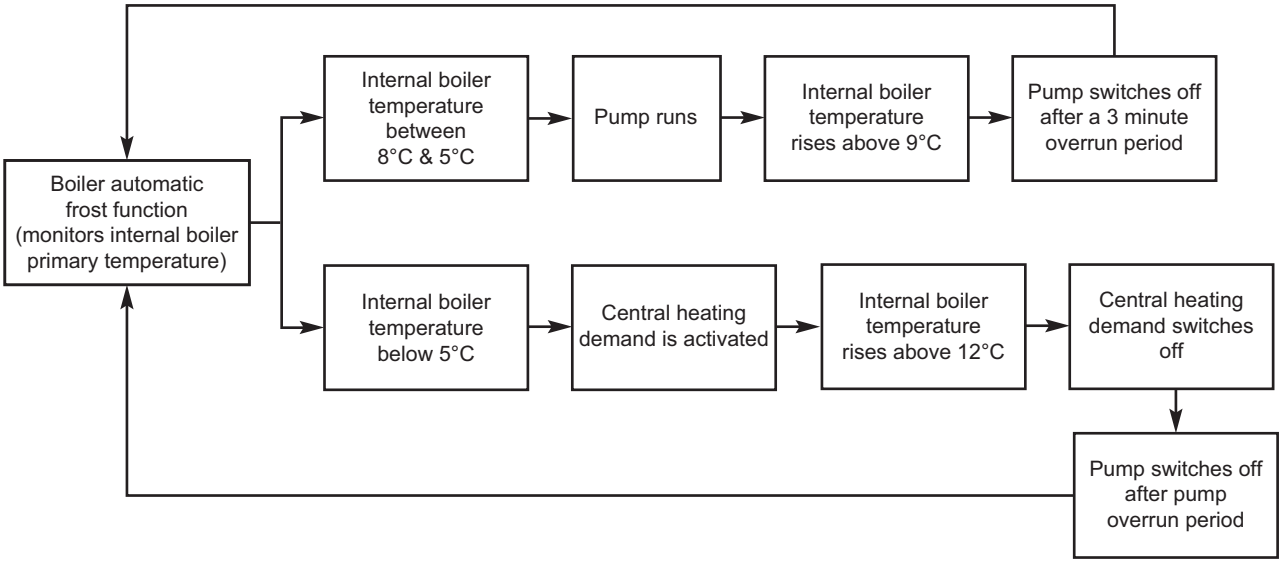

Boiler in standby. GREEN LIGHT ON
CENTRAL HEATING DEMAND
Pump ON. Diverter valve to CH position.
Fan to start speed. Gas valve open.
Ignition spark 4 seconds (max)
BURNER LIT?
YES
NO
RED LIGHT ON
Burner stabilises at start speed for 5 - 10 seconds.
Fan reduces over 15 seconds.
Fan min. speed for 90 seconds.
Boiler unused for long period?
YES
NO
Minimum heat input for 15 minutes.
Boiler operates to match system load and CH control setting.
Over temperature shut-down if water temperature is above set value.
Gas valve shuts. Pump remains ON.
Burner remains OFF until flow temperature is below set value -10 K.
Fan run to purge gas from burner.
5th Attempt?
NO
YES
LOCKOUT
CH demand satisfied.
Gas value closes RED light OFF.
Pump and Fan run for up to 3 minutes.
6 7206 815 062-34.2O

7.3 DHW function

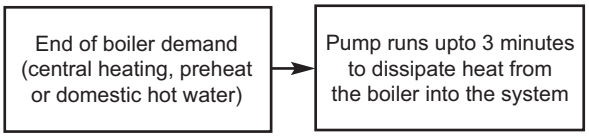

Boiler in standby or CH demand. GREEN LIGHT ON
Hot water demand (overrides all other demands).
Tank demand (overrides CH demand).
Pump OFF Diverter valve to Hot Water position. Pump ON
Ignition sequence.
Ignition sequence.
Gas valve OFF until temperature drops to set level.
Delivered temperature too high.
Modulate fan (heat input) to maintain delivered temperature se by user control (45° - 65°C)..
Modulate fan (heat input) to charge tank to temperature set by user control (65° -75°C)
Minimum heat imput until 50°C if boiler unused for long period.
End of demand.
Tank satisfied.
Check tank temperature. Is it still near set point?
NO
YES
GAS VALVE OFF
Continue fan 40 seconds. Continue pump 15 seconds.
6 720 815 062-35.1O

7.4 Protection function

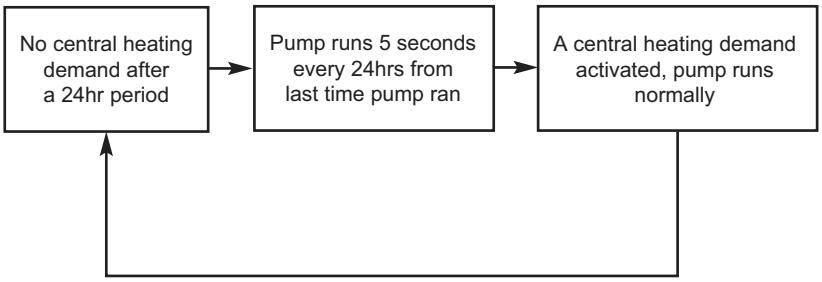
AUTOMATIC INTERNAL FROST FUNCTION


Boiler automatic frost function (monitors internal boiler primary temperature)
Internal boiler temperature between 8°C & 5°C
Pump runs
Internal boiler temperature rises above 9°C
Pump switches off after a 3 minute overrun period
Internal boiler temperature below 5°C
Central heating demand is activated
Internal boiler temperature rises above 12°C
Central heating demand switches off
Pump switches off after pump overrun period

PUMP OVERRUN FUNCTION


End of boiler demand (central heating, preheat or domestic hot water)
Pump runs upto 3 minutes to dissipate heat from the boiler into the system

PUMP ANTISEIZE FUNCTION


No central heating demand after a 24hr period
Pump runs 5 seconds every 24hrs from last time pump ran
A central heating demand activated, pump runs normally

6720648665-36.1Wo

7.5 Fault finding

- This fault finding information is for guidance only. Worcester Bosch cannot be held responsible for costs incurred by persons not deemed to be competent.
- The electronic control system for this boiler incorporates a blue central indicator. This normally confirms the permanent mains supply, but, by flashing during a fault, provides a guide to the cause as listed.
- This fault finding system assumes that the appliance has been operating normally until the time of failure (i.e. not a first time installation error).

BOILER - FAULTS AND CONDITIONS		
Display code:	**Fault description**	**Check, repair/replace as necessary**
A1	Pump dry run detection or Pump is running in air	Check the system pressure, refill if necessary
A5	Tank NTC defect	Check tank NTC sensor and leads, measure resistance across NTC (33.5k Ω- 500 Ω)
A7	DHW NTC defect	Check DHW NTC sensor and leads, measure resistance across NTC (33.5k Ω- 500 Ω)
A8	EMS communication error	Check electrical connections of EMS controls (if fitted), connections on the control board, replace control board.
b1	Code plug not detected	Insert code plug correctly, test and replace as necessary.
b2, b3, b4, b5,b6	Data error	Replace control board.
b7	Burner control error	Replace control board.
C6	Fan defect	Check fan, lead, and connector, replace as necessary.
D3	External temp limiter	Check plug connector ST8, link missing/damaged between 8 & 9 on ST8 .
D5	Condensate pump failure	See condensate pump table.
D6	Internal heat bank overflow	Check system pressure, tank over heat thermostat and leads, and pump operation
EA	Flame not detected	Check gas is present and working gas pressure, ignition electrodes and harness, flame sense electrode and harness, and operation of gas valve. Replace as necessary.
E2	Primary NTC defect	Check primary NTC sensor and leads, resistance across NTC should be between 36k to 1k Ω
E9	OH stat tripped	Check system pressure, over heat thermostat, and pump operation. Check fuse (T1.6A slow blow), replace as necessary.
F0	Internal error	Check all electrical connections, replace board as necessary.
F1	ROM error check	Check all electrical connections, replace board as necessary.
F7	Flame detected after appliance shut off	Check flame sense electrode and harness, and control board for signs of water damage. Replace as necessary
FA	Flame detected after gas shut off	Check flame sense electrode and harness, and control board for signs of water damage. Check gas valve operation. Replace as necessary
Fd	Reset button pressed	Press reset button again

Table 25

Preliminary checks:

Preliminary electrical system checks are the first electrical checks to be carried out during a fault finding procedure.
On completion of the Service/Fault finding task which has required the breaking and remaking of electrical connections, check:
a) EARTH CONTINUITY
b) SHORT CIRCUIT CHECK
c) POLARITY
d) RESISTANCE TO EARTH.

7.6 Condensate pump Indicator lights

The condensate pump has indicator lights (A) which show operation status or a fault condition.

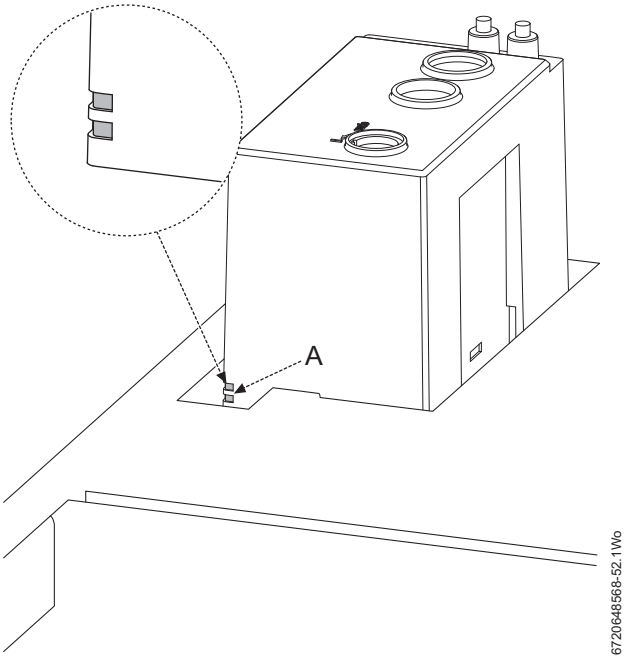


Fig. 81 Condensate pump indicator lights

CONDENSATE PUMP - OPERATING LAMPS AND FAULT CONDITIONS Ready for operation = Steady green light Fault = Red light Pump running = Flashing green light			
Operating lamps		Cause	Solution
Green	Red		
Off	Off	Mains plug not plugged in Power failure	Insert plug Check mains and fuse
Flashing	Flashing	Dry-run (poss. air in pump)	Pump restarts automatically after one minute
On	Flashing	Pump blocked	Visual inspection of the pump inlet in the tank and removal or rinsing out of dirt/ foreign bodies
On	On	Level exceeds alarm level	Pressure hose / non-return valve blocked (clean or remove kink if applicable)
Off	Flashing	Pump blocked and alarm level exceeded	Visual inspection of the pump inlet in the tank and removal or rinsing out of dirt/ foreign bodies

Table 26

SERVICE RECORD

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions. Always use the manufacturer's specified spare part when replacing controls.

SERVICE 01						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 02						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 03						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 04						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 05						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 06						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 07						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 08						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 09						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

SERVICE 10						Date:
Engineer name:						
Company name:						
Telephone No:						
Gas safe register No:						
Record:	At max. rate:	CO	ppm	**AND**	CO_2 %	
	At min. rate: (Where Possible)	CO	ppm	**AND**	CO_2 %	
Comments:						
Signature						

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.

benchmark COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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GAS BOILER SYSTEM COMMISSIONING CHECKLIST

This Commissioning Checklist is to be completed in full by the competent person who commissioned the boiler as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission according to the manufacturer's instructions and complete this Benchmark Commissioning Checklist will invalidate the warranty. This does not affect the customer's statutory rights.

Customer name:	Telephone number:
Address:	
Boiler make and model:	
Boiler serial number:	
Commissioned by (PRINT NAME):	Gas Safe register number:
Company name:	Telephone number:
Company address:	
	Commissioning date:
To be completed by the customer on receipt of a Building Regulations Compliance Certificate*	
Building Regulations Notification Number (if applicable):	

CONTROLS (tick the appropriate boxes)				
Time and temperature control to heating	Room thermostat and programmer/timer		Programmable room thermostat	
	Load/weather compensation		Optimum start control	
Time and temperature control to hot water	Cylinder thermostat and programmer/timer		Combination Boiler	
Heating zone valves	Fitted		Not required	
Hot water zone valves	Fitted		Not required	
Thermostatic radiator valves	Fitted		Not required	
Automatic bypass to system	Fitted		Not required	
Boiler interlock			Provided	

ALL SYSTEMS				
The system has been flushed and cleaned in accordance with BS7593 and boiler manufacturer's instructions			Yes	
What system cleaner was used?				
What inhibitor was used?			Quantity	litres
Has a primary water system filter been installed?	Yes		No	

CENTRAL HEATING MODE measure and record:			
Gas rate	m³/hr	**OR**	ft³/hr
Burner operating pressure (if applicable)	mbar	**OR** Gas inlet pressure	mbar
Central heating flow temperature			°C
Central heating return temperature			°C

COMBINATION BOILERS ONLY				
Is the installation in a hard water area (above 200ppm)?	Yes		No	
If yes, and if required by the manufacturer, has a water scale reducer been fitted?	Yes		No	
What type of scale reducer has been fitted?				

DOMESTIC HOT WATER MODE Measure and Record:			
Gas rate	m³/hr	**OR**	ft³/hr
Burner operating pressure (at maximum rate)	mbar	**OR** Gas inlet pressure at maximum rate	mbar
Cold water inlet temperature			°C
Hot water has been checked at all outlets	Yes	Temperature	°C
Water flow rate			l/min

CONDENSING BOILERS ONLY	
The condensate drain has been installed in accordance with the manufacturer's instructions and/or BS5546/BS6798	Yes

ALL INSTALLATIONS							
Record the following:	At max. rate:	CO	ppm	**AND**	CO/CO_2	Ratio	
	At min. rate: (where possible)	CO	ppm	**AND**	CO/CO_2	Ratio	
The heating and hot water system complies with the appropriate Building Regulations						Yes	
The boiler and associated products have been installed and commissioned in accordance with the manufacturer's instructions						Yes	
The operation of the boiler and system controls have been demonstrated to and understood by the customer						Yes	
The manufacturer's literature, including Benchmark Checklist and Service Record, has been explained and left with the customer						Yes	

Commissioning Engineer's Signature
Customer's Signature
(To confirm satisfactory demonstration and receipt of manufacturer's literature)

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.

benchmark COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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